District of Saanich
Community Wildfire Protection Plan 2020

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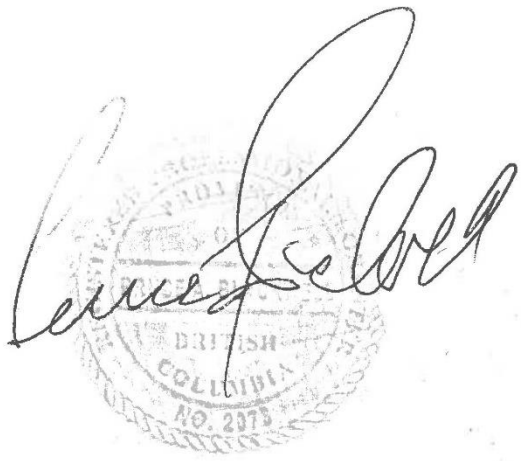
*Cover photo: View of south Saanich from Mount Douglas; Agnieszka Duszynska, B.A. Blackwell & Associates

REGISTERED PROFESSIONAL SIGN AND SEAL

RPF PRINTED NAME	
Bruce Blackwell	2073
DATE SIGNED	
April 22, 2021	
I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.	
Registered Professional Forester Signature and Seal	
	

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, administered by the Union of BC Municipalities, CWPPs aim to develop strategic recommendations to assist in improving safety and to reduce the risk of damage to property from wildfires.

This CWPP will provide the District of Saanich ('DOS', or 'District') with a framework that can be used to review and assess areas of identified high fire risk within the Area of Interest (AOI) which is defined by the municipal boundary. Additionally, the information contained in this report should help to guide the enhancement and/or development of emergency plans, emergency response, evacuation plans, communication and education programs (including FireSmart), and bylaw development in areas of fire risk. Potentially hazardous forest lands on provincial Crown land adjacent to the community are currently administered by the Ministry of Forests, Lands and Natural Resource Operations and Rural Development (MFLNRORD) under the Crown Land Wildfire Risk Reduction CRI program stream.

Wildfire management requires a multi-faceted approach for greatest efficacy and risk reduction outcomes. A total of 27 strategic recommendations are summarized in Table 1. below and are discussed more thoroughly in relevant sections throughout the document. The recommendations within this plan are a toolbox of options to assist the community to reduce the threat of wildfire. There is no one course of action or combination of actions that is the singular answer to the challenge of wildfire risk in communities; the DOS must further prioritize efforts based on resources, strengths, constraints, availability of funding, as well as regularly updating prioritizations and courses of action as variables and circumstances change over time.

Table 1. Summary of CWPP Recommendations by Document Section.

Document Section 2: Local Area Description (2.5.: Linkages to Other Plans and Policies)				
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	18	Moderate	Collaborate with a CRD parks representative and relevant stakeholders to develop a steering committee or a "Community FireSmart Resiliency Committee" to address wildfire related issues and recommendations on a regional level and to develop collaborative solutions to minimize wildfire risks. This committee can serve the secondary function of integrating DOS staff from various departments to implement recommendations from this CWPP. The committee should meet annually or as necessary, to provide progress updates and feedback on any current or planned wildfire mitigation projects.	A 'Community FireSmart Resilience Committee' is eligible for funding. Total cost ~$7,000 (local government costs): ~40 hours to initiate group; an additional ~50 hours/year to plan, advertise/ communicate, attend, and debrief meetings; additional hours required depending on implementable actions and potential sub-committees developed
2	18	High	Evaluate the effectiveness of the RSIFH DPA in mitigating risk and reducing fire hazard in Rural Saanich, and in consultation with inter-departmental staff refine supporting documents as necessary. This review should be carried out over a multi-year time span and be informed by fire department response/call-out data	Local government funding/ UBCM funding.
3	18	Moderate	The Fire Department should continue to work collaboratively with the Planning Department and Inspection Services to review Development Permit applications in the RSIFH DPA and provide input on property wildfire risk and water availability as required.	Dependent on the number of DP applications.

Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
Document Section 3: Values at Risk				
Objective: Protect critical infrastructure and mitigate post-wildfire impacts				
4	34	Low	The Regional Emergency Management Partnership (REMP) should consider lobbying the provincial government or local Medical Health Officer(s) to develop a higher-level strategy for the DOS to draw upon when they are exposed to smoke from wildfire for extended periods of time. This may include smoke exposure risk assessments and exposure reduction measures, such as establishing shelters in place for citizens with acute respiratory or other serious health conditions severely impacted by wildfire smoke.	Local government funding/ Provincial funding
5	34	Low	Complete formal FireSmart assessments (by a qualified professional such as a Local FireSmart Representative) for all DOS owned critical infrastructure (CI) within Rural Saanich. Prioritize CI in areas of high or extreme fire risk.	~$1,500-2,000 per location (consultant cost)
6	34	High	The DOS should continue to communicate with BC Hydro at the beginning of each fire season or as required to review maintenance and access to right-of-ways. Utility right-of-way best management practices (BMPs) should be promoted including regular brushing, clearing of woody debris, and removal of flammable vegetation including scotch broom (*Cytisus scoparius*) and regenerating conifers to help reduce fire risk, utility pole damage and subsequent outages. Brushing and right-of-way mowing work should not occur during high fire danger times to reduce chance of ignitions as per the *Wildfire Act*.	Local government funding in the form of 1 to 2 meetings per fire season with BC Hydro
Document Section 5: Risk Management and Mitigation Factors Recommendations				
Objective: Reduce Wildfire Threat through Fuel Management				
7	74	High	Proceed with detailed assessment, prescription development, and treatment of proposed treatment units identified and prioritized in this CWPP.	UBCM CRI Program Funding/Local Government Funding
8	74	Low	Promote existing green waste disposal programs within the DOS, for example curbside pick-up and free drop-off within the region.	Local government funding.

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Engage in FireSmart Planning and activities				
9	74	Moderate	The DOS should consider applying for funding from the UBCM CRI Program to develop a FireSmart local rebate program. This program will allow homeowners to access partial rebates for FireSmart activities on their properties, if rated as high or extreme risk in a FireSmart home and property assessment. Activities could include installation of FireSmart roofing or windows, woodshed relocation and closing of open decks. Prioritize offering the program to residents in Rural Saanich. A Local FireSmart Representative could be engaged part-time to deliver the program. Consideration should be made to allow for interdepartmental input.	Local/UBCM Funding. FireSmart Community Funding & Supports program funding.
10	74	High	The DOS should continue to train additional Fire Prevention staff as Local FireSmart Representatives (LFRs) to increase organizational knowledge in this area and to support ongoing public education and wildfire risk mitigation. In order to increase public uptake and participation, future initiatives should focus efforts following an active fire season in BC to maximize the resources available for community engagement.	LFR training provided for free by FireSmart BC; costs of attending training fundable by UBCM CRI
Objective: Increase public wildfire awareness				
11	74	Low	Consider including a Wildfire session in the annual joint Fire Safety Symposium between the Fire Departments from the Districts of Saanich, Central Saanich, North Saanich and Sidney. Consider involvement from Association of BC Forest Professionals (ABCFP) and BCWS (Coastal Fire Centre) staff.	~5-10 in-house staff hours; UBCM CRI Program funding available.
12	74	Low	Encourage the Saanich School District (#63) to continue to adopt and deploy existing wildfire education programs to Grade 5 students. There is emergency preparedness curriculum available provincially, which includes preparedness for a variety of natural hazards, including wildfire	FireSmart BC Education box - $800 (Junior Kindergarten - Grade 12).
13	74	Moderate	The DOS should expand on the information currently available on the Wildfire Protection page of the DOS website, including links to more wildfire prevention resources and information pertaining to Rural Saanich (also see recommendation #18 for resources specific to the agriculture sector).	~10-15 in-house hours (local government funding). May be eligible for UBCM CRI program funding.

14	74	High	This CWPP report and associated maps should be made publicly available through a dedicated webpage on the District's website. In addition, this CWPP should be shared with utility partners (i.e., BC Hydro) who may be interested in collaborating on fuel treatments.	~10-15 hours depending on method of distribution.

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	74	Moderate	Continue implementing the DOS social media strategy to update social media platforms regularly during the fire season to ensure that fire bans, high or extreme Fire Danger days, wildfire prevention initiatives and FireSmart activities are communicated to residents.	~5-10 in house hours per week during fire season
16	74	Low	Given the high public and recreational usage of parks and trails along the western and northern portion of the AOI, the DOS and Saanich Fire Department (SFD) in collaboration with the Fire Protection Officers Association and/or surrounding municipalities and the CRD should develop public education focused on increasing awareness of good wildfire prevention practices.	~15-30 in-house hours (local government funding) and CRD funding. May be eligible for UBCM CRI program funding.
17	75	Moderate	The SFD in coordination with the Saanich Emergency Program (SEP) should consider installing additional fire danger rating signs at key locations in the AOI. Signage should be updated regularly with current fire danger ratings during the peak wildfire season (May through to October).	~$5,000 for signage, Local government funding.
18	75	Low	Promote improved planning and preparedness of agriculture producers and livestock owners in the DOS and encourage wildfire preparedness practices on private farm land through distribution or sharing of wildfire action planning resources prepared specifically for the agriculture sector by the Climate & Agriculture Initiative BC (i.e., on DOS website, mailouts). Resources include a Wildfire Preparedness and Mitigation Plan – Guide and Workbook, which can be accessed online here: https://www.bcagclimateaction.ca/library/wildfire-preparedness/.	~30-40 hours (local government funding). May be eligible for UBCM CRI program funding.
19	75	Moderate	The DOS should develop a wildfire and preparedness educational brochure for Rural Saanich.	Local government funding (may be eligible for UBCM program funding)

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Improve Fire Department Capacity and Equipment				
20	83	Moderate	The SFD should continue to meet with fire departments with whom mutual or automatic aid agreements exist to design and participate in tabletop exercises, train with wildland suppression equipment, and discuss sharing of resources during a potential wildfire event.	Local government funding (may be eligible for UBCM program funding)
Objective: Improve Access and Evacuation				
21	83	Moderate	The SEP should continue to support the Saanich Police to operationalize the Saanich Evacuation Plan by completing mock evacuation exercises at night to mimic poor visibility from smoke conditions.	Local government funding.
Objective: Enhance Training Opportunities				
22	83	Moderate	The SFD should continue to train all staff in drafting from natural water sources and the use of portable pumps through annual training in accordance with NFPA 1002 –Pump Operator Training.	~25-50 in-house hours (local government funding). May be eligible for UBCM CRI program funding.
23	83	Moderate	The SFD should make an effort to organize annual training exercises with BCWS to improve wildfire response capabilities within the AOI.	Local Government Funding
24	83	High	Ensure that the SFD maintains the capability to effectively suppress wildland fires, through wildfire-specific training sessions. SFD staff should continue to receive task force leader training and training that includes SPP-WFF-1 or S-100 and S-185 (combined) or, at a minimum. Consider expanding the training program to maintain a high level of member training specific to interface and wildland fires. For example, SPP-115 provides training to structural firefighters on the use of wildfire pumps and hoses (and fire service hose and hydrants) in the application of Structural Protection Units (SPUs). In addition, parks staff should receive S-100 training at a minimum, if funding allows.	Local government funding (may be eligible for UBCM program funding).

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Improve Structure Protection				
25	83	Moderate	Promote and provide information to residents of Rural Saanich related to residential rooftop exterior sprinklers that can be purchased and installed during the fire season. Owners should consider installing a 500 liter cistern to provide adequate water flow for sprinkler system operation without the need for electricity. This can be incorporated as part of general emergency preparedness communication.	20-40 hours to prepare materials and disseminate information to landowners.
26	83	Moderate	The SFD should explore the feasibility of purchasing their own Type 2 SPU trailer to improve wildfire response (provides protection for 25-30 residences).	$100,000-$150,000 depending on configuration
27	83	High	The District should aim to improve their level of Superior Tanker Shuttle Service (STSS) accreditation to the level required for commercial lines insurance. STSS is a recognized equivalency to hydrant protection and entails well-designed and well-documented delivery of water supplies.	~60-80 in-house hours local government funding.

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COMMONLY USED ACRONYMS

AOI	Area of Interest
BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	B.C. Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CI	Critical Infrastructure
CRD	Capital Regional District
CRI	Community Resiliency Investment Program
CWPP	Community Wildfire Protection Plan
DND	Department of National Defense
DOS	District of Saanich
DPA	Development Permit Area
EOC	Emergency Operations Centre
FMP	Fire Management Plan
FSCCRP	FireSmart Canada Community Recognition Program
HCA	Heritage Conservation Act
HIZ	Home Ignition Zone
LFR	Local FireSmart Representative
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
OCP	Official Community Plan
PSTA	Provincial Strategic Threat Analysis
PTU	Proposed Treatment Unit
QP	Qualified Professional
REMP	Regional Emergency Management Partnership
RSIFH DPA	Rural Saanich Interface Fire Hazard Development Permit Area
SFD	Saanich Fire Department
SEP	Saanich Emergency Program
SPU	Structural Protection Unit
UBCM	Union of British Columbian Municipalities
UCB	Urban Containment Boundary
VAR	Values at Risk
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

The District of Saanich ('DOS', 'the District') staff have recognized that wildfire mitigation and planning is an important component of emergency planning and preparedness for the community. In 2020, B.A. Blackwell and Associates Ltd. was contracted by the municipality to assist in developing a Community Wildfire Protection Plan (CWPP); hereinafter referred to as the 'CWPP' or 'Plan'. This CWPP will focus on integrating the Provincial Strategic Threat Analysis (PSTA), BC Wildfire Service (BCWS) Fuel Type mapping, and improved wildfire threat analysis methodology into the document.

The 2003, 2004, 2009, 2010, 2015, 2017, and 2018 wildfire seasons resulted in significant economic, social, and environmental losses in BC. The 2018 fire season was the most extensive in terms of area burned, surpassing the 2017 fire season. The total suppression costs for the 2018 fire season were calculated at $615 million and the 2017 fire season costs were estimated at over $649 million.[1] Recent wildfire disasters like those experienced in dry, interior climates; such as Slave Lake, Alberta (2011); Washington State (2014 and 2015); Fort McMurray, Alberta (2016); and BC and California (2017, 2018 and 2019) all display the vulnerability of communities and the potential toll of wildfires on families, neighbourhoods and the economy of entire regions. It should be noted that the DOS is situated in a wetter coastal environment with fewer dry-lightning strikes per annum than the aforementioned locations; nevertheless, risk still exists in the DOS, however likely on a smaller scale than observed in the drier parts of the province. These wildfire events, along with critical lessons learned and important advances in knowledge and loss prevention programs have spurred the need for greater consideration and due diligence with respect to fire risk in the wildland urban interface (WUI). [2]

1.1 PURPOSE

The purpose of this CWPP is to identify the wildfire risks within the administrative boundary of the DOS, to describe the potential consequences if a wildfire were to impact the area, 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 the Area of Interest (AOI), in order to give the DOS a current and accurate understanding of the threats to human life, property and critical infrastructure from wildfires. The goal of this CWPP, in addition to defining the threats, is to identify mitigation measures and serve as a framework to inform decisions for implementation 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.

[1] BCWS, 2020. Wildfire Season Summary. Retrieved From: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary

[2] 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 AOI which represents the municipal boundary of the DOS and consists of four general phases outlined in Sections 1.2.1 to 1.2.4 as described below.

1.2.1 Consultation

Engagement with local government, regional government, provincial government, 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 DOS staff representatives; including Frank Macdonald (Deputy Fire Chief), Brock Henson (Assistant Deputy Fire Chief), Carl Trepels (Captain), and Shivonne Taylor (Administration); as well as support from the Saanich Emergency Program (Erin Stockhill and Maegan Thompson); Building, Bylaw, Licensing and Legal Services (Andre James, Brent Reems, and Ian MacDonald); the Engineering Department (Scott Jamieson); the Parks, Recreation and Community Services Department (Eva Riccius); and the Planning Department (Rebecca Newlove and Shari Holmes-Saltzman). Additional support came from the Capital Regional District (CRD) (Shawn Carby); the Department of National Defense (Micheal McLean and Jason Humphries); and the Dominion of Astrophysical Observatory (Marilyn Bell and Derek Mann). At the initial meeting of the Wildfire Working Group, the objective was to obtain information on wildfire risk mitigation initiatives currently in place or completed, existing plans and policies, current resources, areas of concern, 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 review and approval.

BCWS representatives from the Coastal Fire Centre (Dana Hicks and Dimitri Vaisius) were consulted as follows: 1) at the onset of the project planning phase; and 2) throughout the CWPP development process, via the submission of Fuel Type Change Rationales and a questionnaire regarding concerns and priorities with respect to wildfire and emergency planning in the DOS; and 3) to provide review and revisions of the draft document upon plan completion.

Information sharing took place with the Stz'uminus First Nation, Penelakut Tribe, Cowichan Tribes, Lyackson First Nation, Lake Cowichan First Nation, Halalt First Nation, Malahat Nation, Tseycum First Nation, Tsartlip First Nation, Tsawout First Nation, Pauquachin First Nation, Esquimalt First Nation and the Songhees Nation as identified through the Consultative Areas Database. Information sharing consisted of an initial phone call, and subsequent distribution of a referral letter and information package (maps, explanation of the CWPP, and CWPP draft). All potential fuel treatment locations were identified, and feedback was requested to assist in identification of where cultural values may be at risk and require additional protections.

Additional stakeholders were consulted to identify synergies, opportunities for collaboration, and ensure linkages with adjacent and overlapping planning. These stakeholders included BC Hydro, CRD, and the Department of National Defense (DND). Combined, these various consultation and engagement

opportunities have generated a shared understanding of the CWPP objectives and expected outcomes among local and regional 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 DOS was assessed through a combination of the following approaches:

- Natural fire regime and ecology (Section 4.1);
- Provincial Strategic Threat Analysis (Section 4.2); and
- Local wildfire threat analysis (Section 4.3).

1.2.3 Development of a Risk Management Strategy

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

- Fuel management;
- FireSmart planning and activities;
- Community communication and education;
- 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. Community engagement and education strategies are described in Section 5.3. A presentation to DOS council and the SFD senior leadership team will aim to ensure high level approval and support for this CWPP.

SECTION 2: LOCAL AREA DESCRIPTION

This section defines the AOI and describes the District of Saanich. 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 DOS is located in the South Coast region of BC on Vancouver Island, and is approximately 15 kilometers (km) south of Swartz Bay and roughly 2 km north of the Victoria City center. The AOI is defined by the DOS municipal boundary, and is illustrated below in Map 1. The AOI is made-up of multiple neighbourhoods and areas, which include Rural Saanich, Cordova Bay, Royal Oak, Carey, North Quadra, Blenkinsop, Gordon Head, Quadra, Cadboro Bay, Tillicum, Saanich Core and Shelbourne. The built-up

portions of the municipality within the Urban Containment Boundary (UCB) are characterized by a mix of residential, industrial, institutional, and commercial properties; whereas, Rural Saanich is comprised of densely forested residential areas, agricultural lands and industrial areas. In its entirety, the DOS has a population of 114,148 people, which is one of the largest municipal populations on Vancouver Island, and covers a total land area of 104 km^2.[3] A breakdown of the District's land ownership is provided in Table 2.

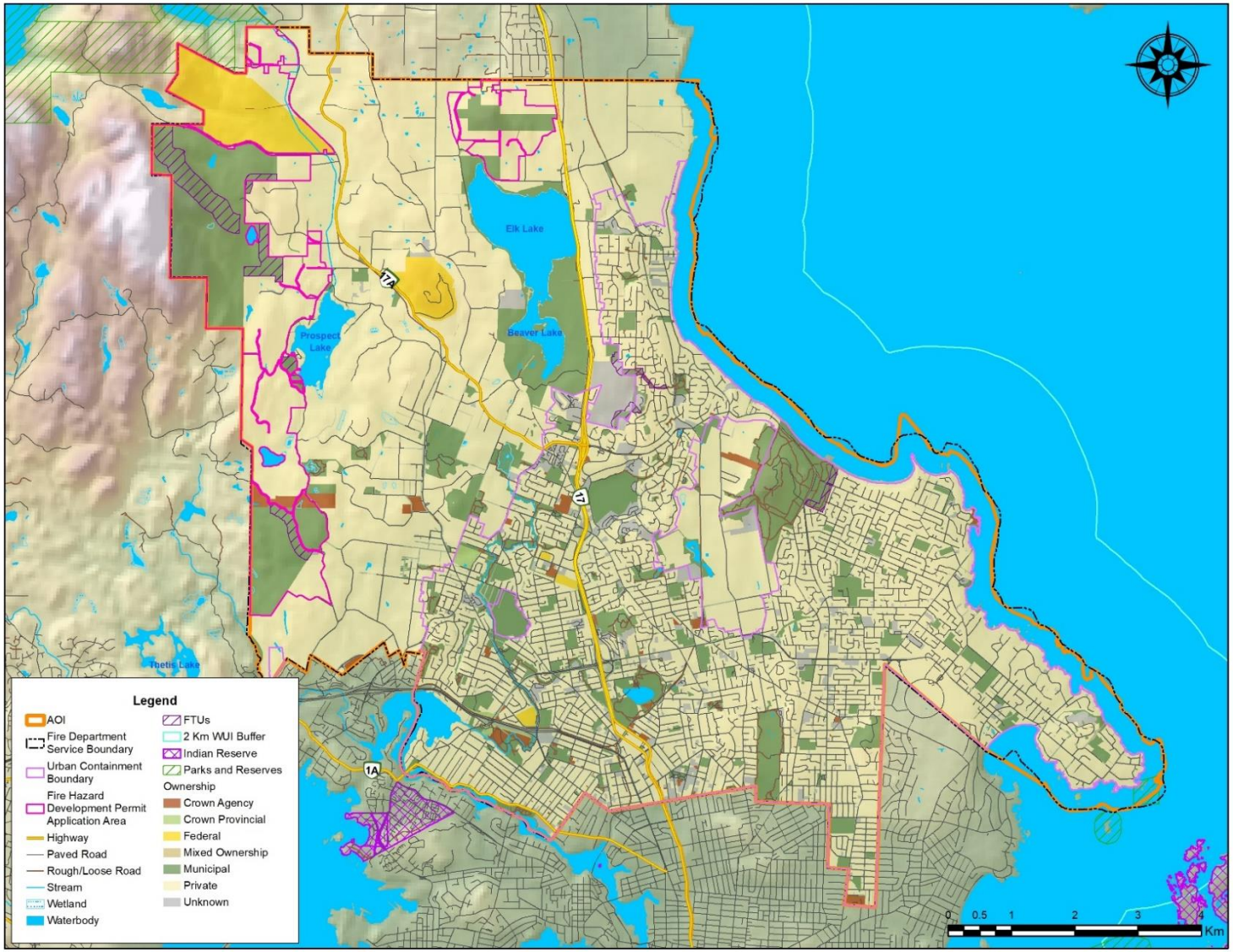
The AOI is topographically diverse, with rolling terrain, marine shorelines, creeks, streams and large waterbodies. Due to this undulating topography elevation varies from sea-level to roughly 200 m in elevation. The largest water bodies within and surrounding the AOI are Elk Lake, Prospect Lake and the Strait of Juan de Fuca.

Table 2: Summary of AOI by land ownership

Land Ownership	Hectares
Crown Agency	98.2
Crown Provincial	2,224.0
Federal	289.0
Municipal	1,824.7
Private	6,519.6
Unknown	379.7
Total	**11,335.3**

*The land ownership source is Parcel Map BC.

[3] Statistics Canada, 2016. Census Profile. Retrieved from: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=5917021&Geo2=PR&Code2=59&SearchText=Saanich&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=5917021&TABID=1&type=0



Map 1: Area of Interest (AOI)

2.2 COMMUNITY DESCRIPTION

The DOS borders seven other communities: the District of Central Saanich in the north, the Juan de Fuca Electoral Area (JDF EA) - Willis Point in the northwest, the District of Highlands in the west, the Town of View Royal in the southwest, the Township of Esquimalt, and the City of Victoria in the south, and the District of Oak Bay in the southeast. The DOS provides planning, engineering and local emergency services (District of Saanich Police and Fire) to all its residents and businesses; however, sewer and water utility services (including water distribution systems, solid waste collection, storm water and sanitary sewage maintenance and management) are only provided to residents and businesses within the UCB. Additional services provided by the DOS include: parks and recreation facilities, bylaw enforcement and Indigenous relations. Trunk sewer services, solid and liquid waste management and watershed and reservoir management are under the jurisdiction of and provided by the CRD. Public and private companies are responsible for providing utilities such as energy, wireless communication, fiber optic and cable networks.

In addition to the infrastructure services provided within the AOI, the District also supports the health and safety of its citizens through various community associations, groups and committees. Some of these associations are involved in land use and planning proposals, as well as parks and recreation. The CRD in cooperation with provincial and federal entities is also equipped with emergency preparedness systems that are focused on ensuring public safety. These systems are geared towards natural disaster response and relief (such as fire protection, search and rescue, emergency management resources and public alert notification systems).

Prior to colonial settlement, the Lək̓ʷəŋən peoples known today as Songhees and Esquimalt Nations, and the W̱SÁNEĆ peoples known today as W̱JOŁEŁP (Tsartlip), BOḴEĆEN (Pauquachin), SȾÁUTW̱ (Tsawout), W̱SIḴEM (Tseycum) and MÁLEXEŁ (Malahat) Nations were among the many Coast Salish First Nations that historically occupied and managed these lands, some of whom continue to live within the DOS today.

The economy of the DOS was historically driven by forestry, farming, agriculture and railway building. Although agriculture continues to remain important to the local economy, in recent decades the economic focus has shifted to industry, commerce, high-tech industry, agri-tourism and eco-tourism, small businesses and commercial, industrial and private residential real estate.[4]

Fire protection within the AOI is the responsibility of the Saanich Fire Department (SFD) which provides fire and rescue services from three fire stations. There are mutual aid agreements with six fire departments within the CRD, which include the City of Victoria, the District of the Highlands, the Township of Esquimalt, the District of Oak Bay, the District of Central Saanich, and the JDF EA - Willis Point. Automatic aid agreements are in place between the SFD and the District of Oak Bay and the District of Central Saanich (see Section 6), and co-operative training is done with the City of Victoria,

[4] District of Saanich, 2008. Sustainable Saanich - Official Community Plan. Retrieved from: https://www.saanich.ca/assets/Local~Government/Documents/Corporate~and~Annual~Reports/2008%20OCP.pdf

District of Oak Bay and District of Central Saanich. In addition to these fire department mutual aid agreements, the DOS is also a member of a separate disaster mutual aid agreement that exists between all 13 municipalities and the CRD (on behalf of the electoral areas).

In the event of a wildfire, a number of neighbourhoods within the AOI have potential emergency access and egress challenges. Neighbourhoods with narrow and windy roads, particularly in Rural Saanich were identified as areas of concern by DOS. More specifically these areas included properties surrounding Bear Hill, the Hartland Landfill, Elk Lake and Prospect Lake. The Trans-Canada Highway (Highway 1) and the Patricia Bay Highway (Highway 17) and West Saanich Road are three of the only reliable access and egress routes in and out of the AOI.

Typically, the wildland urban interface (WUI) is the area where homes and developments meet the forest edge; within the DOS these areas are located along the western and northwestern boundaries of the municipality. The DOS is bordered by regional parks and extensive forested lands in the west and urbanized and developed portions in the south, however, greenbelts, relatively large parklands and remnant forested areas exist throughout the DOS urban fabric. Forested areas within the WUI may contain hazardous fuels in proximity to homes (see Appendix E – Wildland Urban Interface Defined for a complete description of the WUI) (also refer to Map 1). These forested areas represent breaks in the street grid layout, resulting in many residences being located on single access roads which branch off of side streets. This layout, seen commonly in parts of Rural Saanich, not only presents a challenge for emergency access and egress, but also limits the ability of fire crews to establish anchor points for suppression and to safely evacuate residents.

2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

BCWS South Island Fire Zone Staff (Dimitri Vaisius – Wildfire Officer) communicated that the majority of past wildfire activity within the AOI was human caused and reported that any slash fuel types in close proximity to values at risk would be of greatest concern in terms of wildfire risk.

Based on the BCWS historical wildfire dataset (1919-2019), the three largest fires to have occurred within the AOI burned in 1934, 1951, and 1952 burning a total area of 703.1 hectares (ha), or 234.4 ha on average. Two out of the three fires were human caused. Additionally, in 1922, less than 2 km west of the AOI a large, human-caused fire burned an area of 1,109 hectares. It should be noted that the majority of the historical fires that occurred in the AOI took place in the early 30's and 50's when resource extraction and industrial activities were most prevalent and modern fire-fighting capabilities were nonexistent.

Multiple ignitions have occurred within the AOI within the last 20 years. Ignitions consistently occurred in the west and northwest region of the AOI; three out of the four ignition points occurred near or within the Rural Saanich Interface Fire Hazard Development Permit Area (RSIFH DPA). Although these ignitions were suppressed in a relatively efficient manner, many were located less than a kilometer away from hazardous combustibles (landfill materials), major transmission lines, and electrical substations. If the fires had not been suppressed as efficiently, they could have resulted in significant damage to critical infrastructure and stopped the supply of power to parts of the District.

The BCWS historical ignition dataset demonstrates that the proportion of human-caused fires within the DOS is substantially greater than that of the province as a whole.[5] This ignition data shows that within the AOI, approximately 75% of all ignitions since 1919 have been human caused (i.e., not naturally caused), versus 40% of the ignitions in the province of BC that have resulted from human activity.[6] This statistic may be explained by the lower proportion and occurrence of dry lightning strikes in wet coastal regions of the province and high human activity and recreational use such as hiking and biking within many parts of the south coast region where population densities are higher. In addition, the historical prevalence of forestry activities, railways, and other industrial activities, also contributes to this statistic.

2.4 CURRENT COMMUNITY ENGAGEMENT

There are varying levels of recognition and awareness, from DOS staff and the community, of the threat posed to the community by wildfire. The level of awareness, prioritization and knowledge varies based on the conditions of the fire season, personal understanding, and communication of resources. As a result, there have been varying levels of community interest and engagement with regards to wildfire prevention activities and FireSmart initiatives in the DOS. The CRD is currently establishing a regional FireSmart committee and completing a regional FireSmart assessment of all 13 electoral areas and municipalities in efforts to gauge FireSmart engagement and interest within the regional district. On a local level, the SFD has recently completed a FireSmart education campaign in 2020 targeting residents living in Rural Saanich, which included public events and presentations for the Prospect Lake Community Association. Educational materials have been developed and distributed at community events to members. In addition, local staff have completed FireSmart assessments for residents. Fire danger rating signs have also been posted within the AOI to notify residents when fire danger rating is high or extreme. The SFD has done an excellent job at promoting the local Fire Department and their services; however, FireSmart education and awareness could be improved. See Section 5.2 for detailed recommendations pertaining to FireSmart. No fuel management treatments on public land have occurred within the DOS.

2.5 LINKAGES TO OTHER PLANS AND POLICIES

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

2.5.1 Local and Regional Authority Emergency Plans

Emergency response in the DOS is managed at the municipal level. The Saanich Emergency Program (SEP) is a division of the SFD and is responsible for ensuring that municipal efforts, plans and responses to natural disasters from elected officials, municipal departments and emergency services, volunteers as well as outside agencies, are well coordinated. The SEP interacts with neighboring municipalities within the CRD to collaborate on public education, emergency disaster plans, and form mutual aid agreements. At the municipal level, the DOS has developed the 'Saanich Evacuation Plan'[7] which

[5] BC Wildfire Service, 2019: Fire Incident Locations – Historical.

[7] District of Saanich, 2018. Saanich Evacuation Plan.

provides guidance, and outlines the responsibilities of officials in the event of an emergency or disaster. The aforementioned document compliments the District's Emergency Response and Recovery Plan (ERRP). The ERRP provides guidance for staff working in an EOC; other related DOS plans include 'Department Operation Centre Plans' for numerous departments, 'Facility Emergency Response Plan', 'Emergency Support Services Plan', and 'Rapid Damage Assessment Plan'.

In addition, the DOS is a part of the Regional Emergency Management Partnership (REMP) which was created in 2016 to enhance regional emergency management with the CRD by establishing a steering committee to spearhead and aid in prioritizing regional planning initiatives. In addition, the DOS is a member of two regional CRD commissions; the Regional Emergency Planning Advisory Commission, which ensures cooperation and communication between agencies in an emergency; and the Local Government Emergency Program Advisory Commission, which serves to strengthen the region's capacity to prepare for, respond to, and recover from an emergency, as well as to increase cooperation and communication among regional government emergency programs.

The DOS's primary Emergency Operations Centre (EOC) is located in the basement of Fire Hall #1 at 760 Vernon Avenue. The SFD also has the ability to deploy the Saanich Command Vehicle which can be used as a mobile EOC in the event of an emergency. The DOS has approximately 150 staff members that are trained to work in the EOC. The SEP and the Saanich EOC have a close working relationship with EMBC regional managers who frequently attend the District's EOC training, as an EMBC observer or Provincial Regional Emergency Operation Centre (PREOC) role. The PREOC is co-located in the neighbouring District of Central Saanich, allowing direct contact and support with key EMBC personnel. The DOS is also involved in a three-year municipal emergency management training and exercise plan; this training is delivered quarterly and staff engagement and attendance is typically high.

In the event of an evacuation, the DOS is prepared with designated emergency reception centers at the following locations; the Gordon Head Recreation Centre (4100 Lambrick Way), the Cedar Hill Recreation Centre (3220 Cedar Hill Road), the Saanich Commonwealth Place (4636 Elk Lake Drive), and the GR Pearkes Recreation Centre (3100 Tillicum Road). The District also has numerous secondary facility-use agreements in place which can be accessed on an as needed basis in the event of an emergency. These facilities are typically more easily accessible to residents and are utilized prior to primary facilities. The DOS has also provided links online for individual homeowner preparedness, such as the 'Regional Guide to Emergency Preparedness'.[8] This CRD-wide preparedness document provides important information pertaining to individual preparedness, as well as information on local emergency programs, and provides details on how residents can prepare for emergencies.

2.5.2 Affiliated CWPPs

CWPPs have been developed for neighbouring jurisdictions including the District of Central Saanich CWPP (2019), the District of North Saanich CWPP (2019), the Cowichan Valley Regional District (2017, Four Zones - South, Central, West, and North), and the Capital Regional District (2005-2011- for the

[8] District of Saanich, 2018. Prepare Yourself – A Guide to Emergency Preparedness in the Capital Region. Retrieved from: https://www.saanich.ca/assets/Community/Documents/Emergency~Program/Prepare_Yourself_Workbook_4edition.pdf

following communities: East Sooke, Malahat and Durance, Otter Point, Piers Island, Port Renfrew, Shirley and Jordan River, Willis Point; the Juan de Fuca EA; District of Highlands; the Town of View Royal and Regional District parks). These documents, when available, were reviewed for relevance (i.e., synergistic project opportunities, as well as to confirm that there are no contradicting recommendations). These CWPPs were developed 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 these plans that are relevant to the CWPP. The following municipal bylaws, strategies, and policies are relevant to wildfire planning in the DOS.

District of Saanich Official Community Plan (2008)

The Official Community Plan (OCP) provides the DOS the principal legislative tool for guiding future growth and change. Major reviews of the document, undertaken every decade or so, recognize that circumstances can change, new issues can emerge, technology can advance, and new information can surface. The Plan's sections include:

- a vision for the future;
- the planning context;
- planning for environmental integrity in both the natural and built environment;
- planning for social well-being to meet basic needs and strengthening the community;
- planning for economic vibrancy; and
- taking action and tracking progress.

District of Saanich OCP, Chapter 4.0 Environmental Integrity

Describes the District's natural and built environment in relation to climate change, sustainable land use, urban design and accessibility, and future growth. The District is committed to its Climate Action Plan and supports the "British Columbia Climate Action Charter" and is committed to following the "Local Government Green Communities Act". The District is determined to follow policies related to air quality, urban forests, and environmentally sensitive areas through the uptake of the Regional Growth Strategy. This strategy supports the preservation of the Regional Growth Strategy Capital Green Lands plan, the Unprotected Green Space plan, the Green and Blue Spaces plan, the Farm and Agricultural Land Reserve Lands, and the Renewable Resource Lands Policy Areas.

District of Saanich OCP, Chapter 5.0 Social Well-Being

Aims to ensure that the basic community needs and values to maintain people's physical, social, and mental health are met within the DOS. Social well-being objectives are to be achieved through policies that support agriculture and food security, housing, employment, and public health and safety. These public health and safety objectives are met with the support of the SFD and police, and emergency planning policies.

District of Saanich OCP, Chapter 6.0 Economic Vibrancy

Strives to achieve a sustainable economic vibrancy by supporting a high-quality, livable built environment that limits negative impacts to the natural environment. Links economic development to sustainable, environmental, and social policies and practices. Policy goals support diversification and enhancement, and the continued growth of economic infrastructure through the implementation of the Economic Development Strategy, Corporate Plan, and Official Community Plan.

District of Saanich OCP, Appendix N: Development Permit Areas Justification and Guidelines

Section 28: Rural Saanich Interface Fire Hazard Development Permit Area (RSIFH DPA)

Areas mapped as having a 'high' interface fire hazard in the 2004 Interface Fire Hazard Rating plan are encompassed in the Rural Saanich Interface Fire Hazard Development Permit Area (RSIFH DPA). These areas are Durrance/Heal's Range, Hartland, Prospect Lake, Munn Road, and Bear Hill. Guidelines for developments in the RSIFH DPA are summarized as follows:

- All roofing material and insulation must meet Class B fire rating requirements (BC Building Code)
- Building design and construction must be consistent with NFPA Standard 1144[9]
- All eaves and attic vents must be screened using 3 mm non-combustible wire mesh
- Any structure used to store wood must not be within 10 m of a principal dwelling unless constructed according to the above standards;
- All land clearing debris shall be disposed of within 3 months of their accumulation
- The above must be in compliance with the Streamside DPA Guidelines and all other bylaws
- Where a qualified RPF, RFT, or PEng has assessed the proposed development and determined the fire hazard to be low provided specific conditions are met, these guidelines may be relaxed.

Schedule 2: Streamside Development Permit Area

Protects the natural environment along protected streams through the designation and implementation of streamside protection and enhancement areas (SPEA). The objectives of the streamside DPA is to protect streams, their riparian areas, and adjacent upland slopes from development, and to restore and enhance the natural features and biological functions of streams.[10]

District of Saanich Plans

Climate Plan, 2020

Identifies climate change impacts and assesses capacity, identifies and prioritizes actions for different stakeholders in Saanich, including community engagement on adaptation issues. Describes the District's role with regards to public safety, local emergency response, and social well-being. Outlines the District's role in relation to the Federal and Provincial government, Island Health, and individuals, businesses, and community groups. Adaptive strategies for emergency and community health services, as well as Saanich residents and businesses are outlined.

[9] National Fire Protection Association Standard 1144- Standard for Protection of Life and Property from Wildfire
[10] District of Saanich, 2020. Development Permit Areas – Justification and Guidelines. Retrieved from: https://www.saanich.ca/assets/Local~Government/Documents/Planning/Development-Permit-Guidelines-October2020.pdf

Strategic Plan, 2019
Defines the municipality's vision, mission, core values, community themes, goals, initiatives, and actions for 2019 up to 2023.

Interface Fire Hazard Rating, 2004
Classifies each area of concern based on specific community description criteria and fire suppression capabilities as well as special factors, and assigns a community fire hazard rating system. Spatially depicts interface fire hazard rating by location on a map.

Invasive Species Management Strategy, 2013
Outlines how to minimize the spread of invasive species in the District through a comprehensive program and the use of municipal resources.

Parks, Recreation and Culture Master Plan, 2013
Defines the District's current parks, recreation, and culture services and the District's planning process, mission, vision, strategic objectives and recommended initiatives, and background information. Some of the objectives of the plan include: creating a park planning system, encouraging cross-departmental planning, and enhancing marketing and communications.

Urban Forest Strategy, 2010
Outlines the urban forest vision, defines the implementation process, and describes the actions required to meet the defined goals.

CRD Fire Services Agreement - Durrance Rudy Roads, 2017
Stipulates that the SFD, in accordance with a service agreement signed with the CRD, is to respond and service a fire call-out on Durrance/Rudy Road.

Automatic and Mutual Aid Response Services Agreement, 2016
Describes the automatic aid and mutual aid response services that exist between the District of Saanich and District of Central Saanich.

Wildland Fire Response, 2020
Provides response guidelines and procedures for actioning wildland fire incidents for all department personnel; and stipulates, that when needed, the BCWS will be contacted for additional assistance.

Mount Douglas Pumping Evolution, 2012
Describes response guidelines for filling and utilizing the Mount Douglas reservoir and hydrant system. This includes a detailed description of emergency response by apparatus, annual filling procedure, annual draining procedure, procedure for drafting, procedure for relay pumping, and shut down procedure.

Mount Tolmie Fire Response, 2011
Outlines apparatus response guidelines for a fire emergency on Mount Tolmie, including detailed procedure guidelines.

Dominion Observatory Water Supply System, 2007
Stipulates the guidelines for a fire emergency when using private hydrants at the Dominion Observatory.

Hartland Landfill - Fire Response, 2016

Outlines apparatus response guidelines for a fire emergency at the Hartland Landfill, especially procedures regarding water supply, landfill fire rescue procedures, and associated agencies.

Boundary Service Agreement, 2002

Defines the service agreement between the District of Saanich and District of Central Saanich for fire hydrant and water services use between municipalities for Boundary Road and inter boundary services.

Regional Service for Emergency Program Support, 2008

Establishes and provides a regional service for emergency program support, including an information and resource management systems to coordinate with local emergency programs in order to support local authorities and strengthen their capacity to manage a multi-jurisdictional emergency event or regional disaster within the Capital Regional District.

Emergency Response Recovery Plan (ERRP) Wildland Fire

Defines the procedures and policies for responding to a wildland/urban interface fire within the District.

Saanich Fire Department Access Requirements, 2011

Stipulates the requirement for emergency vehicle access, such as SFD response vehicles, for all existing and new construction projects.

Fire Underwriters Survey - Alternative Water Supplies for Public Fire Protection, 2012

Provides a description and rating for fire protective services within the District including background and alternative water supplies, the accreditation process, and the accreditation test procedure.

Memorandum of Understanding - Regional Emergency Management Partnership, 2016

Outlines a memorandum of understanding between the District and surrounding municipalities and electoral areas to enable a cross-jurisdictional response to emergency events. This includes building relationships, planning responses, coordinating emergency management activities, and determining roles and responsibilities before regional emergency events take place.

Mutual Aid Agreement between the CRD and the District of Highlands, 2020

Defines the firefighting mutual aid agreement between the District, the CRD, and the District of Highlands.

Mutual Aid Agreement between the District of Central Saanich and District of Oak Bay, 2020

Defines mutual and automatic aid agreements between the District of Central Saanich and the District of Oak Bay. This enables neighbouring fire departments to share essential tools and provide aid to one another.

Saanich Evacuation Plan, 2018

Outlines the official evacuation guidelines for the District, including authority for evacuation, evacuation considerations, evacuation stages, roles and responsibilities, security and access control, information plans, specific evacuation plan development, and re-entry protocols for the District. Additional resources and information provided include: authorities and legislation, GIS information, evacuation plan

checklists, shelter-in-place, evacuation alert and evacuation order resources and templates, evacuation procedures, and evacuation rescind resources and templates.

District of Saanich Bylaws

Fire Prevention Bylaw, 2006, No. 8807

Describes the SFD, including the establishment of the Fire Department, authorization, the powers and duties of the Fire Chief, and the delegation of inspection duty to Fire Chief. Explains the protection of life and safety; including fire safety plans, evacuation, vacant buildings, fire damaged buildings, access to fire hydrants, duty of owners or occupiers, safety of forests and properties, and false alarms. Outlines procedures at the scene of the fire; including right of entry, investigation of fires, hindrance, breaking blockades, and demolition. Outlines inspections, including the right to inspect, special authorization, the duty to provide assistance, and dealing with obstructions. Describes the control of open air burning; including open air fires, validity and permits, issuing, regulation of burning, domestic incinerators, fires on foreshores, garbage burning, smoke opacity standards, burning permitted, person in charge of fire, restrictions, special burning outside the UCB, and Fires that the Fire Chief may authorize. Discusses dangerous goods, including the safe handling of dangerous goods and explosions or potential explosions. Outlines enforcement and the issuance of order, service of order, removal of order, and penalty and repeal. This bylaw is currently in the process of being updated and should be referred to when conducting future decision-making processes related to fire prevention.

Land Use and Development Application Fee Bylaw, 2006, No. 8798

Imposes fees with respect to land use and development application. Outlines the fee for a development permit or development permit amendment application for lands in the RSIFH DPA.

Minimum Property Maintenance Standards Bylaw, 1978, No. 4050

Establishes minimum standards and enforcement with regards to the repairs and maintenance of residential and non-residential properties in the municipality. Section 2 outlines the applicability of the Bylaw to those properties that present a fire hazard or other safety issues. Subsection 4d requires an accessory building to be kept in condition that is free from fire hazards. Subsection 6c(ii) requires the maintenance of fire-resisting walls to maintain their resisting quality.

Building Bylaw, 2019, No. 9529

Establishes regulations, probations, and requirements for construction in the District. Section 7.16 states that developers constructing works or upgrading existing services on parcels along street frontage will comply with the subdivision bylaw No. 7452 (discussed below). Section 8.2 requires that adjacent public property is not disturbed or disrupted. Section 15.1 stipulates that structures must be served by a fire access route up to standard, and that spark arrestors must be in new chimneys.

Emergency Program Bylaw, 2001, No. 8212

Provides a comprehensive management program to prepare for, respond to, and recover from emergencies and disasters. Establishes an emergency management committee and appoints an emergency coordinator. Section 3.2(b) allows the District to enter into agreements with the CRD or adjacent municipalities for emergency assistance or formulation of coordinated emergency preparation,

response and recovery. Section 3.5 describes the preparation of the Emergency Response and Recovery Plan (ERRP Wildland Fire document). Section 4.4(f) outlines the requirement to conduct studies and exercises to ensure preparedness and assess readiness.

Garbage Collection and Disposal Bylaw, 2013, No. 9233

Establishes the general services, fees, and associated regulations for garbage collection and disposal.

Fireworks Regulation Bylaw, 2007, No. 8865

Prohibits the selling of fireworks and regulates the possession and discharge of fireworks unless an approved permit is in place.

Parks Management and Control Bylaw, 1997, No. 7753

Establishes the management, control and use of parks, beaches and other public places within the District of Saanich. Section 9 states that no person shall deposit cigarettes, matches or other burning substances; nor light a fire (unless with an approved permit); nor discharge a firearm or fireworks in parks.

Street Address Bylaw, 1995, No. 7453

Establishes guidelines and assigns street address for any new developments within the District. Considers changes to street addresses in subdivisions, as well as regulates the displaying and maintenance, duplication, alteration, design, and size of street addresses within the District.

Subdivision Bylaw, 1995, No. 7452

Regulates subdivision of lands, construction of highways, and development. Outlines the provision of and required level of water services, including those installed to provide fire protection; such as fire hydrants along highways, roads, streets, and in residential areas. Describes the water distribution system, fire hydrant system, sewage collection system, and drainage disposal system works and services within subdivisions. Section 7 states the scope of works and services a property owner must abide by.

Tree Protection Bylaw, 2014, No. 9272

This bylaw regulates the altering, cutting, removal and damage of trees; describes the conditions for permits; sets requirements for replacement, mitigation or other forms of compensation; and establishes provisions relating to inspection and enforcement of the above.

Water Utility Bylaw, 2000, No. 8124

Provides instruction for the operation and management of a water utility. Defines required service levels, outlines the design and construction of piping systems and meters, and addresses repair and prevention of contamination. Section 8 describes regulations restricting the use of water, fees and water rates, pressure supply, and quantity.

Boulevard Regulation Bylaw, 2018, No. 9487

Establishes the laws pertinent to the obligations and permitted activities of owners and occupiers of a parcel abutting a boulevard, activities requiring a boulevard permit, the permit issuance and its conditions, and the enforcement and penalties for those who contravene this Bylaw. Section 4.1.(a) requires owners to keep grass or weeds within the boulevard mowed or trimmed to a height of not more

than 15 cm; (b) keep property free of brush, debris, loose materials, and in a tidy condition; (c and d do not apply to fire safety); (e) keep landscaping trimmed and pruned below certain threshold heights; (f) water regularly in accordance with water restrictions; (g) remove materials that are or may become hazardous.

Oil Burning Equipment and Flammable Liquid and Combustible Liquid Fuel Tank Bylaw, 2014, No. 9265

Regulates the installation/removal, inspection, and maintenance of oil burning equipment, flammable liquid, and combustible liquid fuel tanks. Section 7 prohibits fuel installation or removal without a permit; Section 9 places limitations on the capacity of tanks according to District Zone; Section 11 outlines requirements for ongoing maintenance of tanks

Zoning Bylaw, 2003, No. 8200

Regulates the use of land and the location, size, shape and use of buildings and structures erected thereon, having due regard to the promotion of health, safety, convenience, and welfare of the public.

Development Cost Charges Bylaw, 2019, No. 9553

Stipulates that development cost charges may be imposed for the purpose of providing funds to assist the municipality in paying the capital costs of providing, constructing, altering, or expanding infrastructure and services, such as: sewage, water, drainage, park lands, and highway facilities.

2.5.4 Higher Level Plans and Relevant Legislation

Regional Green/Blue Spaces Strategy, 1997

The strategy proposes a network of parks, unprotected green space and waterways, agricultural land, and managed forest land in the CRD. The primary goal of the strategy is to enable environmental protection and provision of ecological services across municipal boundaries. The CRD contains municipal, provincial (Gowlland Tod Provincial Park and ŁÁU,WELNEW/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 CRD.

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 population 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 increases the likelihood 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 to increase 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.

Climate Projections for the Capital Region, 2017

This document describes downscaled climate change projections for the CRD and is intended to support planning and decision-making for community partners whose work may be impacted by climate change. This analysis synthesizes general climate projections, precipitation indicators, summer temperature indicators, winter temperature indicators, regional impacts and provides a summary of how the projections may translate into community impacts across different sectors.

Capital Regional District Growth Strategy, 2018

This document outlines the CRD regional growth strategy. The CRD's growth objectives focus on managing and balancing growth, environment and infrastructure, housing and community, transportation, economic development, food systems, and climate action. This plan also outlines implementation measures, community profiles, frameworks, and visions.

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.

Vancouver Island Land Use Plan (VLUP)

The Vancouver Island Land Use Plan (VLUP) is the higher-level planning document for all of Vancouver Island, including the DOS. 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.

Coast Area 2015-17 Coastal Timber Supply Areas Forest Health Overview

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.[11] 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.

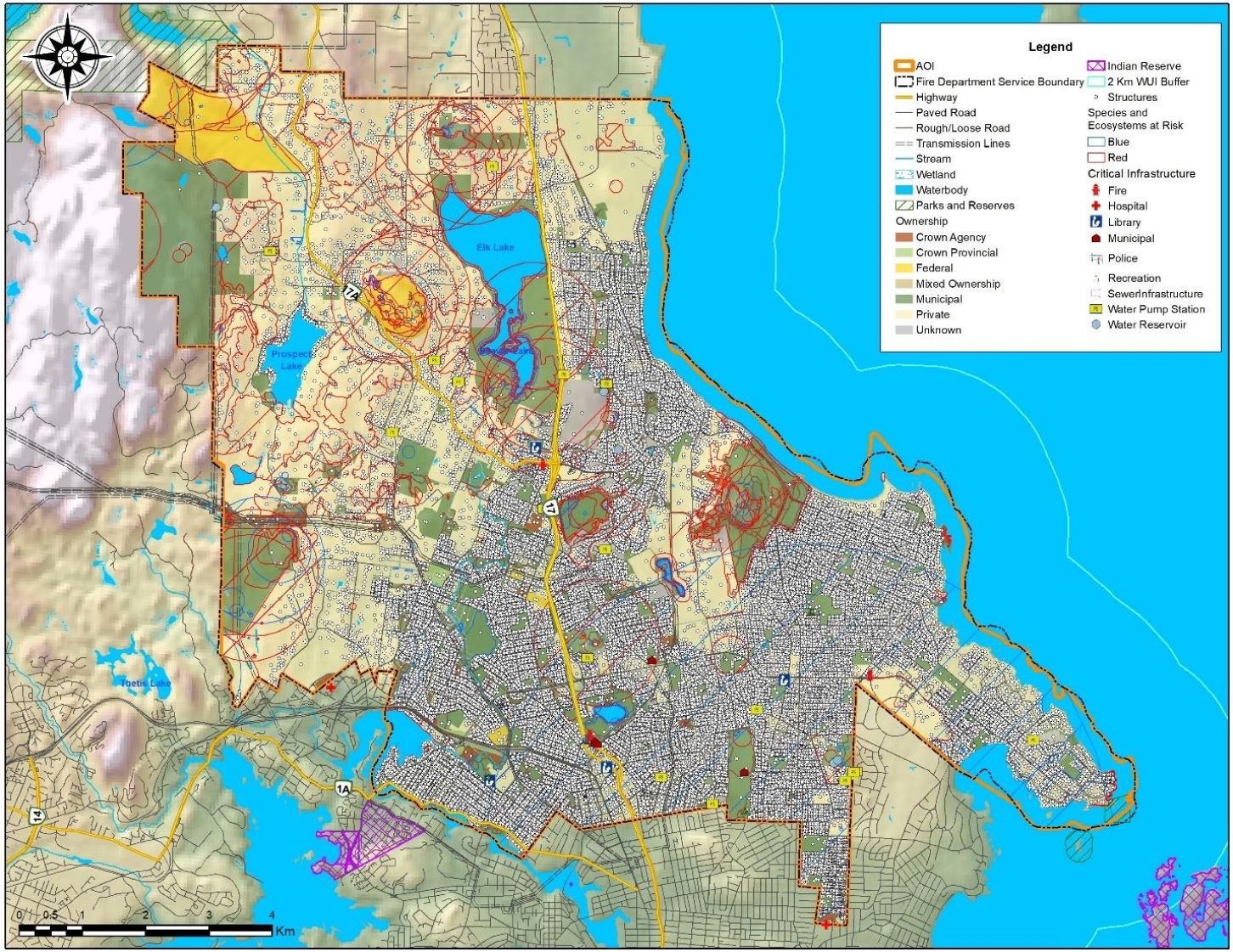
[11] Ministry of Forests, Lands and Natural Resource Operations. 2015

Table 3. Section 2: Local Area Description Recommendations

Item	Recommendation / Next Steps
RECOMMENDATION #1	Collaborate with a CRD parks representative and relevant stakeholders to develop a steering committee or a "Community FireSmart Resiliency Committee" to address wildfire related issues and recommendations on a regional level and to develop collaborative solutions to minimize wildfire risks. This committee can serve the secondary function of integrating DOS staff from various departments to implement recommendations from this CWPP. The committee should meet annually or as necessary, to provide progress updates and feedback on any current or planned wildfire mitigation projects.
RECOMMENDATION #2	Evaluate the effectiveness of the RSIFH DPA in mitigating risk and reducing fire hazard in Rural Saanich, and in consultation with inter-departmental staff refine supporting documents as necessary. This review should be carried out over a multi-year time span and be informed by fire department response/call-out data
RECOMMENDATION #3	The Fire Department should continue to work collaboratively with the Planning Department and Inspection Services to review Development Permit applications in the RSIFH DPA and provide input on property wildfire risk and water availability as required.

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



Map 2. Values at Risk within the AOI.

3.1 HUMAN LIFE AND SAFETY

One of the primary goals of the BCWS is to support emergency response and provide efficient wildfire management on behalf of the BC government. BCWS aims to protect life and values at risk, while enhancing the health and resilience of BC ecosystems.[12]

Human life and safety are the first priority in the event of a wildfire; and the effective evacuation of people from at-risk areas and ensuring safe egress is imperative. 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 potential accidents (see Section 6.1.3).

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 DOS has increased in recent years and was measured at 114,148 in the 2016 Census; compared to a 2011 population of 109,752.[13] Based on 2016 census data the DOS has a growth rate of approximately 4% and accounts for just under a third of the total population of the CRD, and has a population density of approximately 1,100 people per square kilometer.[14] Within the DOS there are approximately 49,422 private dwellings, 94% of which are occupied on a full-time basis. The DOS attracts visitors for hiking, walking, biking, boating and other recreational endeavors, particularly during the fire season (May – October). Several parks and recreation sites throughout the AOI are highly used during the summer months, including: Mount Douglas Park, Mount Tolmie Park, Bear Hill Park, Elk Lake Park, Thetis Lake Regional Park, and Francis King Regional Park. Furthermore, the Trans-Canada Highway (Highway 1) and the Patricia Bay Highway (Highway 17) are a main transportation corridor between the District and the rest of Vancouver Island; these routes would be the main roadways used to evacuate residents away from the District in the event of a wildfire.

Knowledge of, and access to, updated structure locations within the DOS is a critical step in efficient and successful emergency response planning. Through field visits, review of recent orthophotography, and spatial data, a new spatial layer with current structure locations was created.

[12]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

[13]Statistics Canada, 2020. 2016 Census. Retrieved from: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=5917021&Geo2=CD&Code2=5917&SearchText=saanich&SearchType=Begins&SearchPR=01&B1=All&TABID=1&type=0

[14]Statistics Canada, 2020. 2016 Census. Retrieved from: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=5917021&Geo2=CD&Code2=5917&SearchText=saanich&SearchType=Begins&SearchPR=01&B1=All&TABID=1&type=0

3.2 CRITICAL INFRASTRUCTURE

Publicly and provincially owned critical infrastructure (CI) are assets owned by the Provincial government, local government, public institutions (such as the local health authority or school district) and First Nations. CI is essential to the health, safety, security and economic well-being of the community, and the effective functioning of government.

Protection of 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. CI includes emergency and medical services, electrical services, transportation, water and sanitation, social services, and communications infrastructure. A CI dataset was provided by the District's GIS staff and this data is included in Map 2. Furthermore, Table 4. provides a detailed inventory of CI identified by the DOS and confirmed via field visits; which has been stratified into the following categories: municipal buildings, water and sewage, and electrical power.

Protection of CI has proven to be an essential wildfire preparedness function. Survival and continued functionality of these facilities not only supports the community during an emergency but also determines, to a great degree, the extent and cost of wildfire recovery and economic and public disruption. CI provides important services that may be required during a wildfire event or may require additional considerations or protection. As outlined in Section 5.2, FireSmart principles are important when reducing wildfire risk to critical structures and are reflected in the outlined recommendations. During field visits, it was observed that the District's CI (e.g., fire halls, municipal buildings, and utilities) are in compliance with FireSmart principles, with the exception of older buildings. The proximity of flammable vegetation was variable with regards to surrounding hazardous landscaping and vegetation, irrespective of building age.

3.2.1 Electrical Power

Electrical service for most of the DOS is received from BC Hydro through a network of above-ground and below-ground distribution lines (lower voltage), these distribution systems receive power from local substations. There are two substations, in the south-central portion of the AOI, and multiple transmission lines that intersect the AOI. 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.[15]

Within the DOS, most of the urban areas are serviced by both above-ground and below-ground distribution systems; however, in Rural Saanich the majority of the neighbourhoods are supplied exclusively with electricity via above-ground, street-side wooden poles that connect to homes. This type of distribution system is particularly vulnerable to wildfire. Any size fire has the potential to impact this

[15]BC Hydro, 2020. Power Smart – Earthquakes, wildfires, and floods. Retrieved from: https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html

service by causing a disruption in network distribution through direct or indirect means. For example, heat from the flames or fallen trees associated with a fire event may cause power outages. Consideration must continue to be given with regards to protecting this critical service and providing power back up at key facilities to ensure that the emergency response functions are reliable. The District currently collaborates with BC Hydro to ensure that all ROW utility lines are in compliance with vegetation and maintenance BMPs.

Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which can cut out power for days, or even weeks. Secondary power availability is variable throughout the AOI. Some water reservoirs/pump stations in the AOI have secondary power available via generators and dual feed configurations; however, the remaining reservoirs are fed via transmission lines that can become compromised in the event of a wildfire. The majority of critical infrastructure within the AOI such as the Fire Hall, municipal hall and all sewer pumping stations are equipped with backup generators. Nevertheless, vulnerabilities for secondary power sources include mechanical failure, potentially insufficient power sources should a wide-scale or long-term power outage occur, and fuel shortage in the event of prolonged outages. Refer to Section 6.1.2 for discussion and recommendations related to backup power and water availability for fire suppression.

3.2.2 Communications, Pipelines and Municipal Buildings

There is one FortisBC pipeline that intersects the southern portion of the AOI, and runs south to north along Wittier Avenue and up to the Harriet Road and Cadillac Avenue intersection. In the event of an emergency, the FortisBC website states that employees will consult with local authorities and emergency response officials in the event of a wildfire.[16] A full inventory of critical infrastructure for emergency services and municipal buildings with updated locations is presented in Table 4 below. Pipelines are inventoried with other hazardous infrastructure in Table 7.

Table 4. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Bruce Hutchison Library*	4636 Elk Lake Drive
Cedar Hill Community Recreation Centre	3220 Cedar Hill Road
Cedar Hill Golf Course	1400 Derby Road
G.R. Pearkes Community Recreation Centre	3100 Tillicum Road
Gordon Head Recreation Centre	4100 Lambrick Way
Nellie McClung Library	3950 Cedar Hill Road
Saanich Centennial Library	3110 Tillicum Road
Saanich Commonwealth Place*	4636 Elk Lake Drive
Saanich Fire Hall No.1	760 Vernon Avenue

[16] Fortis BC, 2020. Wildfires and Evacuations. Retrieved from: https://www.fortisbc.com/safety-outages/preparing-for-emergencies/wildfires-and-evacuations#tab-0

Critical Infrastructure Type	Location
Saanich Fire Hall No.2	4595 Elk Lake Drive
Saanich Fire Hall No.3	1900 McKenzie Avenue
Saanich Municipal Annex	770 Vernon Avenue
Saanich Municipal Hall	770 Vernon Avenue
Saanich Parks and Public Works	1040 McKenzie Avenue
Saanich Police Department	760 Vernon Avenue

* Place names with an asterisk are multi-use buildings.

3.2.3 Water and Sewage

The DOS receives all of its domestic water supply from the CRD through the Regional Water Supply System, with the exception of those living outside of the UCB[17] that rely on private well water. The CRD system is comprised of the following reservoirs: Sooke Lake, Butchart Lake, Wesley, Lubbe Lake, Rithet, Goldstream Lake, Hartland, Mt Tolmie and Haliburton.[18] The Rithet, Mount Tolmie, Wesley and Hartland reservoirs in particular are used by the DOS to store and supply drinking water, in addition to providing system balancing and fire and emergency storage.[19] The DOS distributes water via three transmission mains to approximately 115,000 residents and businesses within the municipality. This system consists of 545 km of watermains, the four reservoirs listed above, 50 pressure reducing valves (PRV) and 18 pump stations.[20] The CRD and DOS are jointly responsible for water quality testing throughout the year, with the DOS providing annual water quality reports for the public. In addition, the DOS has adopted a multi-barrier approach to reducing the risk of water borne infections, which includes: watershed protection, water treatment, distribution system maintenance, and water quality monitoring.[21]

The District's sanitary sewer system transports wastewater within the sewer enterprise boundary to the CRD-owned wastewater treatment facility. This sewer system is comprised of 550 km of sewer mains, 30,000 service collections, 5,240 manholes and 40 pump stations.[22] Those that live outside of the service boundary, about one third of all houses in Saanich, rely on private septic tanks for waste water

[17] The urban containment boundary is mapped in the DOS Official Community Plan and includes the built-up area in the southeast of the District.

[18] CRD, 2020. Regional Water Supply Service. Retrieved From: https://www.crd.bc.ca/service/drinking-water/systems/regional-water-supply-system

[19] District of Saanich, 2019. District of Saanich Drinking Water Quality 2019 Annual Report. Retrieved from: https://www.saanich.ca/assets/Community/Documents/Engineering/2019%20Saanich%20Water%20Quality%20Annual%20Report_Final_Posted.pdf

[20] District of Saanich, 2020. Water. Retrieved from: https://www.saanich.ca/EN/main/community/utilities-garbage/water.html

[21] District of Saanich, 2019. District of Saanich Drinking Water Quality 2019 Annual Report. Retrieved from: https://www.saanich.ca/assets/Community/Documents/Engineering/2019%20Saanich%20Water%20Quality%20Annual%20Report_Final_Posted.pdf

[22] District of Saanich, 2020. Sanitary Sewer. Retrieved from: https://www.saanich.ca/EN/main/community/utilities-garbage/sanitary-sewer.html

management.[23] The CRD is currently upgrading its wastewater treatment facility into a tertiary treatment facility that consists of the McLoughlin Point Wastewater Treatment Plant and a residuals treatment facility at the Hartland Landfill. This system will be supported by a conveyance system that will pump waste water and residual solids across the core area.[24] Both the water supply system and sewer system are critically dependent on reliable electrical power for pumping and controls.

Water availability for fire suppression varies throughout the AOI. Within the UCB, the District is well equipped with fire hydrants; however, in areas outside of the water service area, such as Rural Saanich, the SFD relies on Superior Tanker Shuttle Service for fire suppression. In Rural Saanich, the ability to tap into reservoirs and draft from natural water sources is beneficial for fire suppression. In the water service area, flow testing and pressure checks are done annually to assess overall system performance. Through these tests, certain areas within the AOI such as Mount Douglas and Mount Tolmie were found to have limited water pressure. Locations for water and sewage infrastructure (current as of 2020) within the DOS is detailed below in Table 5.

Table 5. Critical Water and Sewage Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Dunkirk Lane Sewer Pump Station	West of Dunkirk Lane
Albina Sewer Pump Station	Northeast of Albina Street and Obed Avenue intersection
Allison Sewer Pump Station	Northwest of Braefoot Road and Allison Road
Alpine Sewer Pump Station	West and behind Alpine Crescent
Arbutus Cove Sewer Pump Station	Within Arbutus Cove Park
Arundel Sewer Pump Station	Southwest of Arundel Drive
Ash Sewer Pump Station	South of Durling Place and Ash Road intersection
Ashley Sewer Pump Station	North of Ashley Road
Austin Sewer Pump Station	South of Austin Avenue and Gorge Road W intersection
Batu Water Pump Station	OPP 5630/5631 Batu Road
Beach Park Sewer Pump Station	Within Cordova Bay Park
Brett Sewer Pump Station	End of Brett Avenue, adjacent to the Swan Lake Nature Sanctuary
Cherry Tree Bend Water Pump Station	Cherry Tree Bend
Christmas Sewer Pump Station	Southeast intersection of Christmas Avenue and Shelbourne Street
Cloverdale Water Pump Station	Cloverdale Avenue

[23] District of Saanich, 2020. Sanitary Sewer. Retrieved from: https://www.saanich.ca/EN/main/community/utilities-garbage/sanitary-sewer/sewer-enterprise-boundary.html

[24] Capital Regional District, 2020. Wastewater Treatment Project. Retrieved from: https://www.crd.bc.ca/project/wastewater-treatment-project

Critical Infrastructure Type	Location
Cordova Bay/Lavinia Sewer Pump Station	Northwest of Lavina Lane
Cromwell Reservoir	North of Camcrest Place and Mayfair Diver intersection, on top of Mount Tolmie
Cromwell Water Pump Station	Cromwell Rd at Bonair Place
D'Arcy Lane Sewer Pump Station	End of D'Arcy Lane, east of Cordova Bay and D'Arcy intersection
Durling Sewer Pump Station	North of Durling Place
Dysart Sewer Pump Station	North of Dysart Road and Keb Avenue intersection
Garnet Sewer Pump Station	North of Garnet Road and Spilsbury Street intersection
Glenwood Sewer Pump Station	Northwest of Westing Road and Glenwood Avenue
Grange Sewer Pump Station	Northwest of Grange Road and Trans Canada Intersection
Haliburton Pump Station	Within Doris Page Park
Hampton Sewer Pump Station	Within Hampton Park
Hartland Reservoir	Northeast of the Heartland Landfill entrance, off of Heartland Avenue
Hartland Water Pump Station	OPP 161 Hartland Avenue
Jennifer Water Pump Station	Cedar Hill Cross Rd at Merriman Drive
Maplewood Water Pump Station	Maplewood Drive at Cook Street
Mount Tolmie Reservoir	Top of Mount Tolmie, north of Camcrest Place
Mt. Douglas pump Sewer Pump Station	North of Cordova Bay Road and Cedar Hill Road Intersection
Murray # 1 Sewer Pump Station	Southeast of Murray Drive and Ashley Road Intersection
Murray # 2 Sewer Pump Station	Southwest of Murray Drive and Ashley Road intersection
Nigel Sewer Pump Station	North of Nigel Avenue and Vernon Avenue Intersection
Old West Saanich Water Pump Station	OPP 5005 Old West Saanich Road
Parker Sewer Pump Station	Alongside Parker Avenue, adjacent to Golf Course
Pear Sewer Pump Station	East of Poplar Avenue and Shelbourne Street intersection
Pearce Sewer Pump Station	Northeast of Pearce Crescent and Blenkinsop Road intersection
Phyllis Sewer Pump Station	Northeast of Phyllis St and Tudor Avenue intersection
Quayle Water Pump Station	Quayle Rd at Interurban Road
Rainbow Water Pump Station	OPP 4033 Rainbow Street
Rithet Reservoir	Southeast of Perez Drive and Boulderwood Dr

Critical Infrastructure Type	Location
Royal Oak Water Pump Station	OPP Building 4470 West Saanich Road, Patricia Bay Highway at Royal Oak Avenue
Seamist Water Pump Station	Near 803 Seamist Place at end of road
Seaview # 1 Sewer Pump Station	South of Seaview Road and Tudor Avenue intersection
Seaview # 2 Sewer Pump Station	Southwest of Cadboro View Road
Seaview # 3 Sewer Pump Station	South of Tudor Ave and Seaview Road intersection
Shoreway Sewer Pump Station	East of Shore Way, South of Glencoe Cove-Kwatsech Park
Smuggler's Cove Sewer Pump Station	Southeast corner of Smugglers Cove Road and McAnally Road
Stoneywood Water Pump Station	Near 4333 Stoneywood Lane
Townsend Water Pump Station	OPP 4845 Townsend Drive
Tudor Sewer Pump Station	Southern bend of Tudor Avenue
Vantreight Sewer Pump Station	North of Appleton Place and Vantreight Drive intersection
Wedgewood Water Pump Station	Arbutus Road at McColl Place
Wesley Reservoir #1	South of Wesley Road behind residential homes
Wesley Reservoir #2	South of Wesley Road behind residential homes
Wetherby Sewer Pump Station	Intersection of Weatherby Road and North Dairy Road
Wilkinson Sewer Pump Station	North of Trans Canada Hwy, northwest of Bute Street and Portage Road intersection

3.3 HIGH ENVIRONMENTAL AND CULTURAL VALUES

The following section identifies high environmental and cultural values and describes where they are located within the AOI. Environmental, cultural, and recreational values are prevalent throughout the AOI. A more detailed account of environmental and biodiversity aspects of this region is presented in Section 4.1.

3.3.1 Drinking Water Supply Area

As outlined above, Rural Saanich is situated outside of the UCB and receives the majority of its potable water supply from ground wells. As a result, the District is committed to protecting and maintaining the potable water supply in Rural Saanich by implementing the following measures: working with the CRD and the Province to monitor groundwater quantity, quality, and enabling/executing public education

programs about groundwater quality protection and conservation for private well users.[25] In contrast, the urban areas of the District receive potable water primarily from the CRD's Sooke reservoir, and if needed, from the various supplementary reservoirs. Protection from contamination of these water sources is essential and ensured through the following avenues: 1) protection from unauthorized activities in, and ownership of, remaining catchment lands surrounding the Greater Victoria Water Supply Area (GVWSA); 2) completing a biosecurity risk assessment and implementing biosecurity mitigation measures; 3) implementing GVWSA climate change adaption initiatives; 4) protecting and enhancing forest health and resilience within the GVWSA through active forest management; and 5) reducing the risk of a landscape level wildfire through the design and implementation of forest fuel management treatments.[26]

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.

The potential hydrological impacts of wildfire extend past the time a fire is extinguished. Depending on fire size and severity, there is the potential severity of impacts can extend up to a few years post-burn.[27] Because the CRD water system is fed from open surface-water reservoirs, the system is vulnerable to impacts from wildfire. In the event of a catastrophic wildfire in proximity to the CRD Sooke reservoir, the main feeder reservoir to the DOS, the CRD should strive to mitigate negative environmental effects as much as possible, such as minimizing the effects on raw water quality from fire ash, particulates, and surface runoff from barren slopes.[28] The CRD's water treatment processes do not currently include a filtration step which could 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 Aboriginal peoples group whose territory overlaps the DOS. According to information from the BC Consultative Areas Database, there are 14 First Nations with territories that overlap the municipal boundary. These First Nations, Tribes, or treaty association are as follows: Esquimalt First Nation, Halalt First Nation, Lake Cowichan First Nation, Lyackson First Nation, Pauquachin First Nation, Stz'uminus First Nation, Tsartlip First Nation, Tsawout First Nation, Tseycum

[25] District of Saanich, 2008. Official Community Plan. Retrieved from: https://www.saanich.ca/assets/Local~Government/Documents/Corporate~and~Annual~Reports/2008%20OCP.pdf

[26] Capital Regional District, 2017. Regional Water Supply Strategic Plan. Retrieved from: https://www.crd.bc.ca/docs/default-source/crd-document-library/plans-reports/drinking-water/iws2017stratplan.pdf?sfvrsn=417009ca_4

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

First Nation, Malahat Nation, Songhees Nation, Penelakut Tribe, Cowichan Tribes and the Te'mexw Treaty Association. Information regarding the CWPP was shared with all of the aforementioned First Nations, Nations, Tribes and Treaty Associations as described in section 1.2.1.

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

Due to site sensitivity, the locations of archaeological sites may not be made publicly available. However, data provided by the MFLNRORD Archaeology Branch confirms that numerous sites exist within the AOI. The District should ensure that they have direct access to Remote Access to Archaeological Data (RAAD) which the District can procure at the fuel management prescription phase for fuel treatments. Access to RAAD, will allow the District to look up or track any archeological sites in the area.[29] 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.

The use of machinery has 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 ensure 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 DOS, 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 numerous documented species and ecosystems at risk occurrences present within the AOI (Table 6). There are also four masked occurrences in the northwest portion of the AOI, however these occurrences are located on private or federal land, and are therefore not affected by the proposed

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

treatments on municipal Crown land. Nevertheless, there are numerous locations within the AOI that have been identified as critical habitat for federally listed species at risk.

Through consultation with the CDC and a biologist or qualified professional all site level operational plans must determine if the occurrence or habitat 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 CDC data available to ensure that any new occurrences or relevant masked occurrences are known and considered in the operational plan, and to mitigate any potential impacts on species at risk.

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

Common Name*	Scientific Name	Category	BC List	Habitat Type	Area (Ha)
American Bittern	*Botaurus lentiginosus*	Vertebrate Animal	Blue	LACUSTRINE; RIPARIAN; SHALLOW WATER; WOODLAND BROADLEAF; SHRUB WETLAND, RIPARIAN	6
Audouin's Night-stalking Tiger Beetle	*Omus audouini*	Invertebrate Animal	Red	TERRESTRIAL: Forest Mixed, Urban	164
Banded Cord-moss	*Entosthodon fascicularis*	Nonvascular Plant	Blue	TERRESTRIAL: Rock Outcrop	2
Bearded Owl-clover	*Triphysaria versicolor ssp. versicolor*	Vascular Plant	Red	TERRESTRIAL: Grassland/Herbaceous, Rock Outcrop, Woodland Broadleaf, Seepage, Epiphytic; PALUSTRINE: Temporary Pool; MARINE: Coastal Bluffs	1
Blue-grey Taildropper	*Prophysaon coeruleum*	Invertebrate Animal	Blue	TERRESTRIAL: Forest Broadleaf, Forest Mixed, Mature Forest, Coarse Woody Debris, Forest Needleleaf, Forest Broadleaf	1
Coast Microseris	*Microseris bigelovii*	Vascular Plant	Red	TERRESTRIAL: Grassland/Herbaceous	32
Coastal Scouler's Catchfly	*Silene scouleri ssp. scouleri*	Vascular Plant	Red	TERRESTRIAL: Grassland/Herbaceous, Shrubland, Coastal Bluff	1
Common Ringlet, Insulana Subspecies	*Coenonympha tullia insulana*	Invertebrate Animal	Red	LACUSTRINE: Riparian; TERRESTRIAL: Bog/Fen, Grassland/Herbaceous, Cropland/Hedgerow, Old Field, Suburban/Orchard, Forest Mixed, Grassland/Herbaceous, Rocky Outcrop, Old Field, Roadside, Cropland/Hedgerow	119

Common Name*	Scientific Name	Category	BC List	Habitat Type	Area (Ha)
Common Woodnymph, Incana Subspecies	*Cercyonis pegala incana*	Invertebrate Animal	Red	TERRESTRIAL: Old Field, Woodland Mixed; PALUSTRINE: Pond	12
Deltoid Balsamroot	*Balsamorhiza deltoidea*	Vascular Plant	Red	TERRESTRIAL: Grassland/Herbaceous	12
Dense Spike-primrose	*Epilobium densiflorum*	Vascular Plant	Red	PALUSTRINE: Herbaceous Wetland; TERRESTRIAL	117
Douglas-fir - Arbutus	*Pseudotsuga menziesii - Arbutus menziesii*	Ecological Community	Red	TERRESTRIAL; FOREST MIXED NEEDLELEAF	313
Douglas-fir / Alaska Oniongrass	*Pseudotsuga menziesii / Melica subulata*	Ecological Community	Red	TERRESTRIAL; Forest mixed	1
Douglas-fir / Dull Oregon-grape	*Pseudotsuga menziesii / Berberis nervosa*	Ecological Community	Red	TERRESTRIAL; Forest needleleaf	1,437
Dun Skipper	*Euphyes vestris*	Invertebrate Animal	Blue	TERRESTRIAL; Forest needleleaf	98
Fern-leaved Desert-parsley	*Lomatium dissectum*	Vascular Plant	Red	TERRESTRIAL: Cliff, Rock Outcrop; Woodland Needleleaf, Woodland Broadleaf	5
Garry oak / California brome	*Quercus garryana / Bromus carinatus*	Ecological Community	Red	TERRESTRIAL; Forest Broadleaf, WOODLAND BROADLEAF	632
Garry Oak / Oceanspray	*Quercus garryana / Holodiscus discolor*	Ecological Community	Red	TERRESTRIAL; Forest broadleaf, Woodland broadleaf	873
Grand Fir / Dull Oregon-grape	*Abies grandis / Berberis nervosa*	Ecological Community	Red	TERRESTRIAL; Forest needleleaf	751
Great Blue Heron, Fannini Subspecies	*Ardea herodias fannini*	Vertebrate Animal	Blue	TERRESTRIAL: forest mixed, forest needleleaf	1
Green Heron	*Butorides virescens*	Vertebrate Animal	Blue	LACUSTRINE; TERRESTRIAL: forest needleleaf; old growth; RIPARIAN; WOODLAND MIXED; CROPLAND/HEDGEROW	36
Howell's Violet	*Viola howellii*	Vascular Plant	Red	TERRESTRIAL: Roadside, Woodland Mixed, Woodland Needleleaf; forest needleleaf	498
Lobb's Water-buttercup	*Ranunculus lobbii*	Vascular Plant	Red	LACUSTRINE; SHALLOW WATER; TERRESTRIAL; TEMPORARY POOL	9
Lodgepole Pine / Peat-mosses CDFmm	*Pinus contorta / Sphagnum spp. CDFmm*	Ecological Community	Red	PALUSTRINE; BOG/FEN	12
Macoun's Meadow-foam	*Limnanthes macounii*	Vascular Plant	Red	TERRESTRIAL: Seepage Slope	1
Moss' Elfin, Mossii Subspecies	*Callophrys mossii mossii*	Invertebrate Animal	Blue	TERRESTRIAL; grassland/herbaceous; RIPARIAN	4

Common Name*	Scientific Name	Category	BC List	Habitat Type	Area (Ha)
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	PALUSTRINE: Shrub Wetland, Forested Wetland, Pond; TERRESTRIAL: Forest Needleleaf	1
Oregon Ash	*Fraxinus latifolia*	Vascular Plant	Red	TERRESTRIAL: Roadside	12
Ozette Coralroot	*Corallorhiza maculata var. ozettensis*	Vascular Plant	Blue	TERRESTRIAL: Forest Needleleaf	12
Painted Turtle - Pacific Coast Population	*Chrysemys picta pop. 1*	Vertebrate Animal	Red	LACUSTRINE: Shallow Water, TERRESTRIAL: Roadside	29
Poverty Clover	*Trifolium depauperatum var. depauperatum*	Vascular Plant	Blue	TERRESTRIAL: Grassland/Herbaceous	27
Prairie Lupine	*Lupinus lepidus*	Vascular Plant	Red	TERRESTRIAL; ROCK OUTCROP	14
Propertius Duskywing	*Erynnis propertius*	Invertebrate Animal	Red	TERRESTRIAL; woodland broadleaf; woodland mixed; rock outcrop, woodland and needleleaf	115
Purple Sanicle	*Sanicula bipinnatifida*	Vascular Plant	Red	MARINE: Coastal Bluffs; TERRESTRIAL: Grassland/Herbaceous, Woodland Broadleaf, Grassland/Herbaceous	6
Red Alder / Skunk Cabbage	*Alnus rubra / Lysichiton americanus*	Ecological Community	Red	TERRESTRIAL; Forest mixed	312
Red Alder / Slough Sedge [Black Cottonwood]	*Alnus rubra / Carex obnupta [Populus trichocarpa]*	Ecological Community	Red	PALUSTRINE; Forested Wetland	201
Rosy Owl-clover	*Orthocarpus bracteosus*	Vascular Plant	Red	TERRESTRIAL: Herbaceous/Grassland	35
Rough-leaved Aster	*Eurybia radulina*	Vascular Plant	Red	TERRESTRIAL: Forest Needleaf	30
Sharp-tailed Snake	*Contia tenuis*	Vertebrate Animal	Red	TERRESTRIAL: Rock Outcrop, Woodland Mixed	44
Slender Popcornflower	*Plagiobothrys tenellus*	Vascular Plant	Red	TERRESTRIAL: Rock Outcrop	32
Slimleaf Onion	*Allium amplectens*	Vascular Plant	Blue	TERRESTRIAL: Grassland/Herbaceous; Woodland Mixed, Rock Outcrop; MARINE: Coastal Bluffs	27
Tall Woolly-heads	*Psilocarphus elatior*	Vascular Plant	Red	PALUSTRINE: Temporary Pool; GRASSLAND/HERBACEOUS	115
Threaded Vertigo	*Nearctula sp. 1*	Invertebrate Animal	Blue	TERRESTRIAL	3,067

Common Name*	Scientific Name	Category	BC List	Habitat Type	Area (Ha)
Trembling Aspen / Pacific Crab Apple / Slough Sedge	*Populus tremuloides / Malus fusca / Carex obnupta*	Ecological Community	Red	TERRESTRIAL	9
Twisted Oak Moss	*Syntrichia laevipila*	Nonvascular Plant	Blue	TERRESTRIAL: Grassland/Herbaceous; Epiphytic, Suburban/Orchard	3
Vancouver Island Beggarticks	*Bidens amplissima*	Vascular Plant	Blue	LACUSTRINE: Herbaceous Wetland, Riparian; PALUSTRINE: Herbaceous Wetland; TERRESTRIAL: Old Field, Cropland/Hedgerow	33
Victoria's Owl-clover	*Castilleja victoriae*	Vascular Plant	Red	TERRESTRIAL: Rock Outcrop	1
Western Branded Skipper, oregonia subspecies	*Hesperia colorado oregonia*	Invertebrate Animal	Red	PALUSTRINE: Bog/Fen; TERRESTRIAL: Old Field, Urban; LACUSTRINE: Riparian	86
Western Bumble Bee	*Bombus occidentalis*	Invertebrate Animal	Blue	TERRESTRIAL: Suburban/Orchard, Forest Needleleaf, Savannah	8
Western Redcedar / Indian-plum	*Thuja plicata / Oemleria cerasiformis*	Ecological Community	Red	TERRESTRIAL; forest mixed	685
Western Redcedar / Vanilla-leaf	*Thuja plicata / Achlys triphylla*	Ecological Community	Red	TERRESTRIAL: Forest Needleleaf; Forest broadleaf; Forest needleleaf	439
Western Screech-owl, Kennicottii Subspecies	*Megascops kennicottii kennicottii*	Vertebrate Animal	Blue	TERRESTRIAL; Forest mixed, forest needleleaf; old forest	329
White-top Aster	*Sericocarpus rigidus*	Vascular Plant	Blue	TERRESTRIAL: Forest Broadleaf, Woodland Broadleaf	31
White Meconella	*Meconella oregana*	Vascular Plant	Red	PALUSTRINE: Temporary Pool; TERRESTRIAL: Grassland/Herbaceous, Shrubland	81
Yellow Montane Violet	*Viola praemorsa var. praemorsa*	Vascular Plant	Red	TERRESTRIAL: Grassland/Herbaceous, Woodland Broadleaf, Woodland Mixed; Rock Outcrop; Woodland Broadleaf	191

*Any yellow listed species overlapping the AOI were omitted from this list. At the fuel management stage all species at risk occurrences should be revaluated and assessed; furthermore, consultation with a biologist must occur prior to the implementation of any future fuel treatments.

3.4 OTHER RESOURCE VALUES

There are multiple resources values associated with the land base, including agriculture, recreation, tourism, and wildlife habitat. Recreation and tourism values in the District are significant; and various tourist attractions, heavily visited sites, and trails are located in the AOI. Popular parks within the District include: Mount Douglas Park, Mount Tolmie Park, Elk Lake Park and others. In addition to a vast network

of hiking trails within forested parcels and interface areas, there are also playgrounds and picnic areas within these parks.

The Arrowsmith Timber Supply Area (TSA) overlaps the District; however, no primary forestry activities occur within the District at this time or in the foreseeable future. Thus, 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 and have fuel that can ignite during an ember shower. A comprehensive list of hazardous values within the AOI is found in Table 7. The management and treatment of fuels in proximity to hazardous infrastructure is critical in order to reduce the risks associated with both structural fire and wildfire. BMPs recommended for the management of hazardous values include: 1) incorporating FireSmart planning and setback requirements for all infrastructure in this category; 2) maintaining fuel/propane emergency shut-off procedures to be enacted immediately and efficiently in the event of an approaching wildfire or ember shower; and, 3) reducing hazardous materials in the wildland urban interface.

Table 7. Hazardous Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Hartland Landfill	1 Hartland Avenue
George Tripp Substation	Southwest of Willow Street and Lochside Drive intersection
Goward Substation	Northwest of Hector Road and Interurban Road intersection
Transmission line: 2L131 - (PIK) Pike Lake Substation > (KTG) Keating Substation	Runs north to south through the western portion of the AOI, in conjunction with 2L132
Transmission line: 2L132 - (PIK) Pike Lake Substation > (KTG) Keating Substation	Runs north to south through the western portion of the AOI, in conjunction with 2L131
Transmission line: IL014 - (VIT) Vancouver Island Terminal > (GTP) George Tripp Substation	Runs west to east, south of Maltby Lake towards Cedar Hill Cross Road and Lochside Drive
Transmission line: IL146 - (GOW) Goward Substation > (CLD) Colwood Substation	Runs west to east through the Highlands towards the Colquitz Neighbourhood
Transmission line: 2L144 - (PIK) Pike Substation > (GOW) Goward Substation	Runs west to east through the Highlands towards the Colquitz Neighbourhood
Transmission line: 1L010 - (VIT) Vancouver Island Substation > (GOW) Goward Substation	Runs north to south along the Malahat Highway and then into the AOI
Transmission line: 1L011 - (VIT) Vancouver Island Substation > (GOW) Goward Substation	Runs north to south along the Malahat Highway and then into the AOI
Transmission line: 2L145 - (PIK) Pike Lake Substation > (BNT) Burnett Rd Substation	Runs north to south through the AOI
Transmission line: 2L146 - (GOW) Goward Substation > (HSY) Horsey Substation	Runs northwest to southeast through the Colquitz and Marigold neighbourhoods

Critical Infrastructure Type	Location
Transmission line: 1L012 - (GOW) Goward Substation > (GTP) George Tripp Substation	Runs east to west through the Colquitz and Royal Oak neighbourhoods
Transmission line: 1L014 - (VIT) Vancouver Island Terminal > (GTP) George Tripp Substation	Runs north to south along the Malahat Highway and then into the AOI
FortisBC Energy Inc. Transmission Pipeline - 2748	Runs south to north along Whittier Ave up to the Harriet Road and Cadillac Avenue intersection

Table 8. Section 3: Values at Risk Recommendations

Item	Recommendation / Next Steps
RECOMMENDATION #4	The REMP should consider lobbying the provincial government or local Medical Health Officer(s) to develop a higher-level strategy for the DOS to draw upon when they are exposed to smoke from wildfire for extended periods of time. This may include smoke exposure risk assessments and exposure reduction measures, such as establishing shelters in place for citizens with acute respiratory or other serious health conditions severely impacted by wildfire smoke.
RECOMMENDATION #5	Complete formal FireSmart assessments (by a qualified professional such as a Local FireSmart Representative) for critical infrastructure (CI) such as the fire halls, emergency operations centers, emergency reception centers, water infrastructure, and other CI as identified in this CWPP (Table 4) and by the DOS. Prioritize CI in areas of moderate, high, or extreme fire risk.
RECOMMENDATION #6	The DOS should continue to communicate with BC Hydro at the beginning of each fire season or as required to review maintenance and access to right-of-ways. Utility right-of-way best management practices (BMPs) should be promoted including regular brushing, clearing of woody debris, and removal of flammable vegetation including Scotch broom (*Cytisus scoparius*) and regenerating conifers to help reduce fire risk, utility pole damage and subsequent outages. Brushing and right-of-way mowing work should not occur during high fire danger times to reduce chance of ignitions as per the *Wildfire Act*.

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

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

and:

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

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 current conditions, and the potential implications of future scenarios 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.[30] Biogeoclimatic subzones are categorized into five Natural Disturbance Types (NDTs) occurring in BC. NDTs are based on the size and frequency of natural disturbances (largely fire) that historically occur within the subzone. NDTs have influenced the vegetation dynamics and ecological functions and pathways that determine many of the characteristics of natural systems. The NDT classification is based on the frequency and severity of disturbance events (such as wildfires), pre-European contact, and provides an indication of historical fire regime. The physical and temporal patterns, structural complexity, vegetation communities, and other resultant attributes should be used

[30]Province of BC. BECWeb.https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html

to help design fuel treatments, and where possible, to help ensure that treatments are ecologically and socially acceptable.[31] As outlined in Table 9 and illustrated in Map 3, the AOI is characterized exclusively by the Coastal Douglas-Fir, moist maritime (CDFmm) BEC Zone which is classified as Natural Disturbance Type 2 (NDT2).

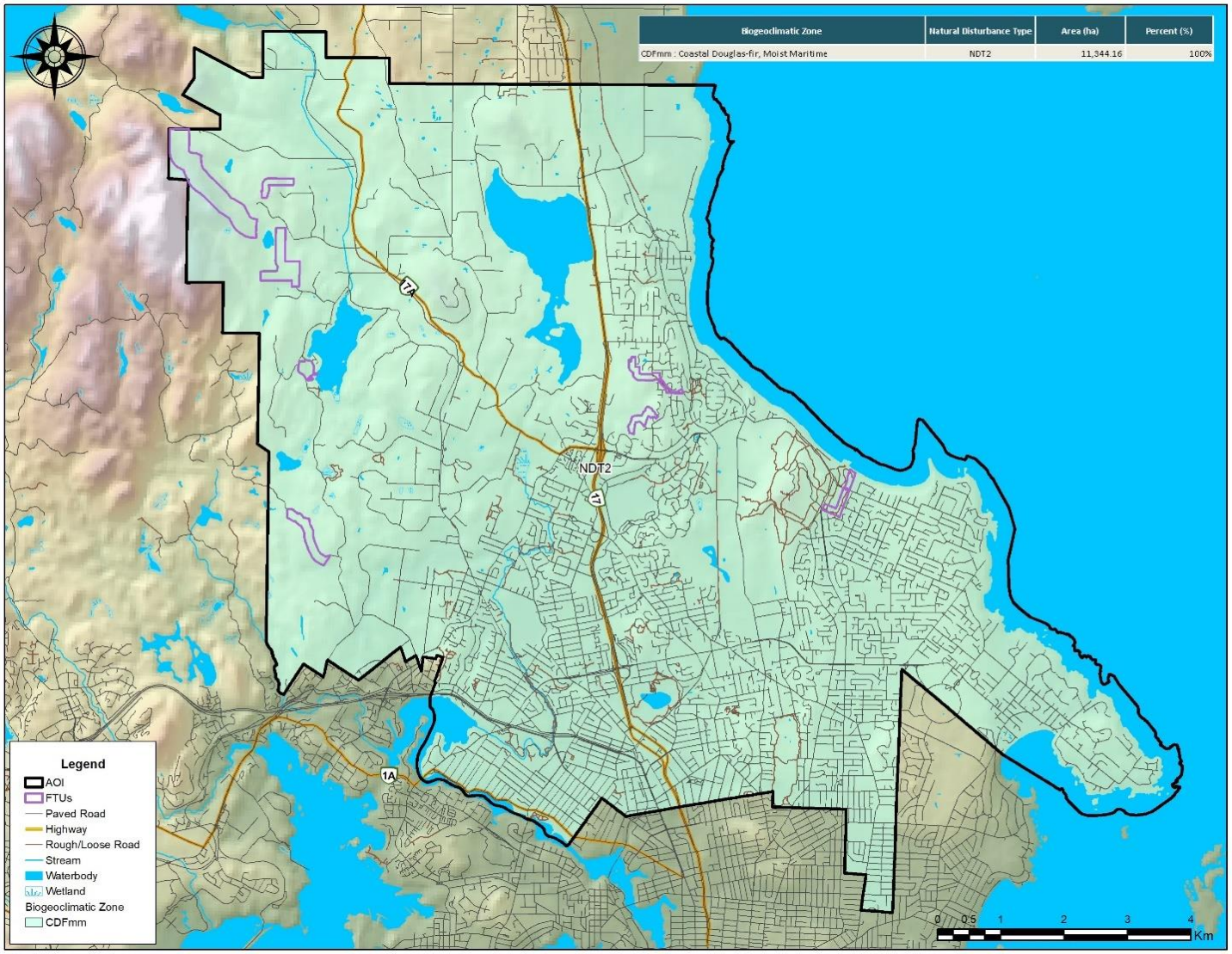
Table 9. BEC zones and natural disturbance types found within the AOI[32].

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CDFmm: Coastal Douglas-Fir, Moist Maritime	NDT2	11,344.2	100%

NDT2 ecosystems are characterized by historically infrequent stand-initiating events where fires are often of moderate size (20 to 1,000 hectares) with a mean return interval of approximately 200 years. Many of these fires occur after periods of extended drought and produce extensive areas of mature forest with intermixed patches of younger forests. Although the fire frequency for this NDT is not high and fires are generally not large, 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.[33] Furthermore, forest health issues, human development, and natural events contribute to changes in the fire regime, forest attributes, and fuel hazard around the community. The DOS is a mosaic of urbanized areas, forests, greenways, parks, and water bodies and is representative of a combination of anthropogenic and natural systems.

[31] Province of British Columbia, 1995. Biodiversity Guidebook, s.l.: s.n.
[32]MFLNRORD BEC Map (DataBC)
[33]Hall, E. 2010. Maintaining Fire in British Columbia's Ecosystems: An Ecological Perspective. Report submitted to the Wildfire Management Branch, Ministry of Forests and Range.



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

Forest Health Issues

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. The occurrence of species such as Himalayan blackberry (*Rubus armeniacus*), English holly (*Ilex aquifolium*), English ivy (*Hedera helix*) and scotch broom (*Cytisus scoparius*) were noted in low to high amounts in 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.

The District is heavily involved in invasive species management and has developed an Invasive Species Management Strategy (ISMS) in order to meet the requirements of the 2019-2023 Saanich Strategic Plan. The main objectives of the ISMS are to address invasive species management on public and private land, outline the roles and responsibilities of staff, set priorities and enable actions, foster community stewardship, and ensure partnerships and resources.[34] The District has also actioned various invasive species management programs including the Saanich Pulling Together Volunteer Program and the Garry Oak Restoration program. Both programs aim to achieve ecological restoration of natural areas within the District and strives to engage members of the community to learn more about invasive species management within the municipality. On a regional level, the District is also part of the Capital Regional Invasive Species Partnership (CRISP) which aims to share information and collaborate more effectively with the surrounding municipalities in the CRD to manage invasive species.[35]

The Coast Forest Health Overview outlines forest health issues present within the Arrowsmith timber supply area (TSA), which overlaps the southern half of Vancouver Island including the District of Saanich.[36] This overview of forest health on the coast (2015-2017) outlines ten forest health issues that are most prevalent within the TSA: 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.[37] These include laminated root disease, a common damaging agent in southern BC; balsam bark beetle; spot disturbances of armillaria root disease; Douglas-fir beetle infestations; and white pine blister rust.

Although, spatial data available through DataBC[38] does not indicate that any significant forest health impacts have occurred within the AOI, field observations did identify significant drought and root disease

[34] District of Saanich, 2020. Invasive Species Management Strategy. Retrieved from: https://www.saanich.ca/assets/Parks~Recreation~and~Community~Services/Documents/InvasiveSpeciesManagementStrategy.pdf

[35] District of Saanich, 2020. Invasive Species Management Strategy. Retrieved from: https://www.saanich.ca/assets/Parks~Recreation~and~Community~Services/Documents/InvasiveSpeciesManagementStrategy.pdf

[36] 2015-17 Coastal Timber Supply Areas Forest Health Overview. 2015.

[37] 2017 Summary of Forest Health Conditions in British Columbia. 2017.

[38] https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons

patches. Historically, minimal forest health issues were likely attributed to agricultural and residential development that reduced continuous forest cover within the AOI; however, with climate change and a maturing forest stand, trees within the AOI are becoming more susceptible to forest health issues. 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

Since the establishment of the District, there have been numerous anthropogenic and natural changes that have occurred on the landscape. Most of these changes can be described as agricultural, residential, infrastructure/institutional, and industrial or commercial development. These processes entailed land clearing and road building that reduced much of the original forest area in the District. The overall implication of human development and ongoing anthropogenic disturbances with respect to wildfire has resulted in a general increase in human ignition potential and a decrease in hazardous fuel cover across the landscape. Land clearing for human development generally increases the non-fuel and O 1a/b fuel types (see Appendix G – Fuel Typing Methodology and Limitations for a description of fuel types). Dead and down woody material accumulations, that have built-up from past forest health issues, in addition to the implementation of sustainable management practices, such as leaving behind large woody debris to maintain wildlife habitat features; have resulted in an increase in hazardous fuels in parks and natural areas.

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

1) Residential land development and settlement activities have resulted in the creation and expansion of the wildland-urban interface (see Section 5.2.3); as a result, fire suppression to protect people, homes, and property within these regions has increased. The District's favourable climate, high recreational and landscape values, and proximity to the Capital and the Gulf Islands continue to make it a desirable place to move to and live in.
2) With a densifying population, the use of trails within the DOS has increased in recent years. Increased recreational use of forested areas has implications for human-caused ignitions, particularly when these activities are undertaken during the hot and dry summer months.
3) Furthermore, backyard barbeque usage and green waste dumping behind homes adjacent to greenbelts, creeks and ravines has the potential to significantly increase human-caused ignitions that may lead to larger interface fires.
4) Nevertheless, the increase in green spaces and open parks that are characterized by well maintained (regularly mowed and watered) grass and turf fields have the potential to reduce wildfire risk within communities.

Fire Weather Rating

Fire Weather refers to weather conditions that are conducive to fire. These conditions determine the fire season, which is the annual period(s) of the year during which fires are likely to start, spread, and cause sufficient damage to warrant organized fire suppression.

The Canadian 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 is used to determine fire danger, represented by Fire Danger Classes, on forest lands within a community. This information is commonly used to monitor fire weather, restrict high risk activities when appropriate, and to determine hazard ratings associated with bans and closures. The SFD is proactive in disseminating fire danger rating information to the public via social and traditional media platforms. In addition, the SFD also actively monitors these indexes throughout the fire season and adjusts its wildland response protocols accordingly.

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

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

It is important to determine the average exposure to periods of high fire danger to develop appropriate prevention programs. Danger Class ratings of 4 (High) and 5 (Extreme) are considered 'high fire danger' ratings. 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 – 2020). 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. 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. On average, August has 28 days of high or extreme fire weather and July has 21 days.

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 - 2020.

4.1.2 Climate Change

Climate change is a complex aspect to consider in wildfire management planning. Numerous studies outline the nature of climate change impacts on wildland fire across Canada, and globally.[39] Current 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,
- Increased forest fire frequency,
- Longer and more intense wildfire seasons, and
- 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. Although there are uncertainties regarding the extent of these impacts on wildfire, it is clear that the frequency, intensity,

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

severity, duration and timing of wildfire and other natural disturbances is expected to be altered significantly with the changing climate.[40] Despite the uncertainties, trends within the data are visible.

As outlined in *Climate Projections for the Capital Region,*[41] the following climate projections for the Capital Regional District, including the District of Saanich were 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; and,
- 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 DOS, 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.[42]

- 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; and,

[40]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.

[41] 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

[42] 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.

- 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 (*Dendroctonus rufipennis*) and Swiss needle cast (*Phaeocryptopus gaeumannii*) may increase, and outbreaks of western hemlock looper *(Lambdina fiscellaria lugubrosa*) may also increase.[43] Additional 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[44];
- The future daily fire severity rating (a seasonally cumulative value) is expected to have higher peak levels and head fire intensity is expected to increase significantly in Western Canada. A bi-modal (spring-late summer) pattern of peak values may evolve to replace the historical late summer peak which is the current norm.[45] The length of fire seasons is expected to increase and the increase will be most pronounced in the northern hemisphere, specifically at higher latitude northern regions. Fire season severity seems to be sensitive to increasing global temperatures; larger and more intense fires are expected and fire management will become more challenging[46, 47]; and
- Future climatic conditions may be more suitable for, or give competitive advantage to, new species of plants, including invasive species[48].

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.

The District of Saanich has taken a proactive approach to meet the challenges of climate change and has committed to continuing climate action through the adoption of its Climate Plan in 2020. The Climate Plan integrates both mitigation (GHG reduction) and adaptation goals and actions for the community

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

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

[45] deGroot, W. J., M. D. Flannigan, A.S. Cantin. 2013. *Climate change impacts on future boreal fire regimes*. Forest Ecology and Management. 294: 35 -44.

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

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

[48] Pacific Climate Impacts Consortium (PCIC). Accessed from: https://www.pacificclimate.org/sites/default/files/publications/Climate_Summary-South_Coast.pdf

and municipal operations. The adaptation components of the plan were developed by exploring and defining local climate projections and resulting community impacts, and undertaking a vulnerability and risk assessment process to define areas of highest risk. Actions were then developed to address these risks and prioritized. Multiple DOS departments, including the SFD were involved in the process, as well as diverse external stakeholders. The Community Well-being Focus Area contains the most relevant directions related to emergency response and community engagement on climate issues, while the Ecosystems Focus Area acknowledges that the forest composition is changing and management strategies will need to adapt.[49]

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. The PSTA provides a starting point to assess the local wildfire threat. Three inputs are combined to create the PSTA wildfire threat analysis component[50]:

1) **Historic fire density**: represents the ignition and fire spread potential based upon historic patterns and fire density weighted by fire size (larger fire perimeters were given a higher weight in order to reflect the greater cost and damage usually associated with larger fires);
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; and,
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.[51] 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

[49] District of Saanich, 2020. Saanich Climate Plan. Retrieved from https://www.saanich.ca/EN/main/community/sustainable-saanich/saanich-climate-plan.html

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

[51] Weighting of the three PSTA wildfire threat analysis components: Fire density 30%; HFI 60%; spotting impact 10% (water bodies were automatically given a value of 'no threat' [-1])

enough to potentially cause catastrophic losses in any given fire season, when overlapping with values at risk. Classes were grouped into the following general threat class descriptions: low (1 – 3); moderate (4 – 6); high (7 – 8); and, extreme (9 – 10).

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

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

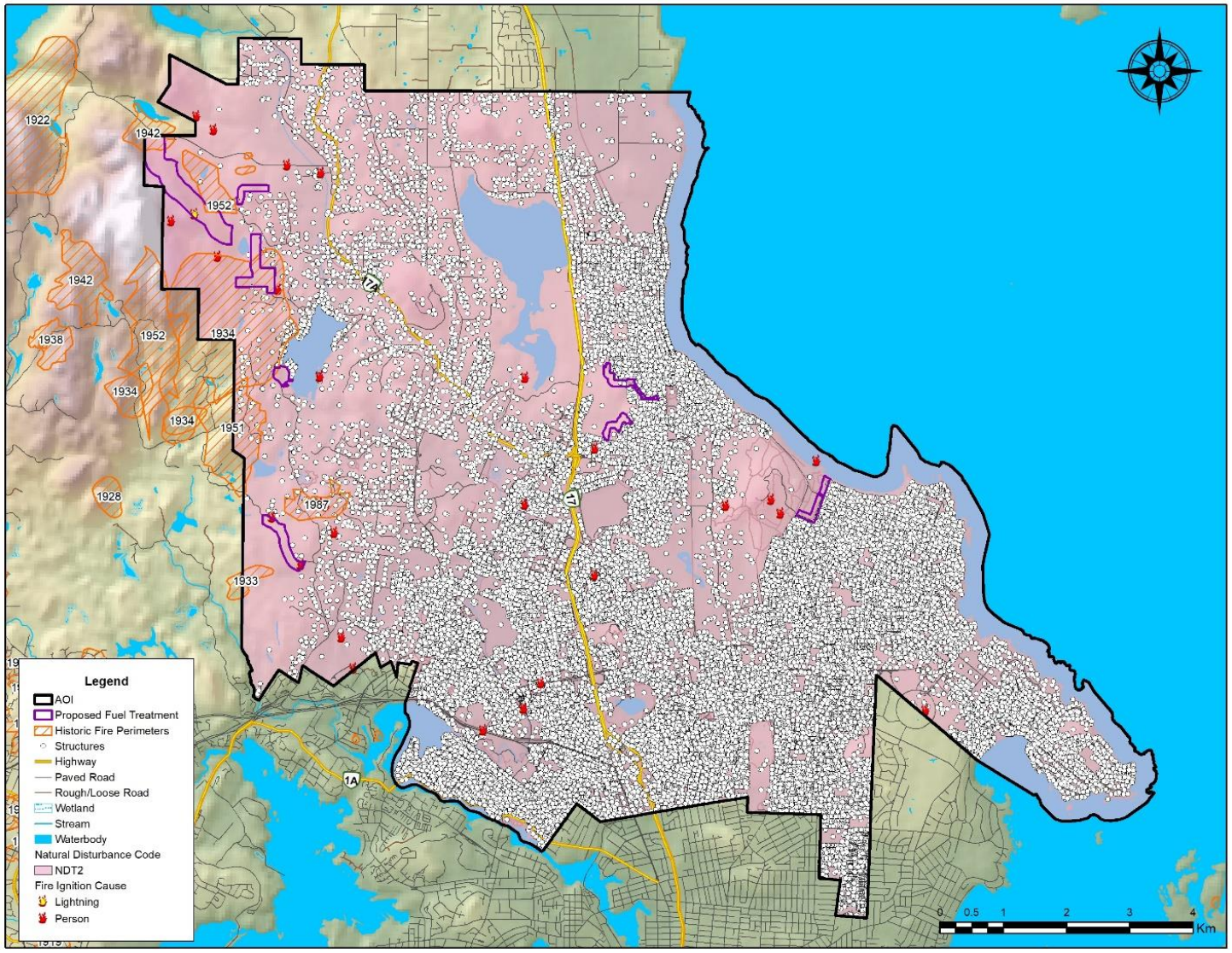
The fire threat ratings from the 2018 PSTA data are summarized below in Table 10. In summary, 55% of the AOI is categorized as either private land or private managed forest land and has no data for wildfire threat in the PSTA dataset. Low threat areas cover 17.6% of the AOI and water covers almost 9% of the total study area. Approximately 13% of the AOI is categorized as having a moderate wildfire threat rating in the provincial Wildfire Threat Analysis. High and extreme threat rating covers just under 5% of the study area.

Table 10. Overall PSTA Wildfire Threat Analysis for the study area (rounded to the nearest hectare).

Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	6,265	No Data (Private Land)	55.2%
-2	6	No Data (Private Managed Forest Land)	0.1%
-1	1,007	Water	8.9%
0	0	No Threat	0.0%
1	2	Low	17.6%
2	126		
3	1,864		
4	926	Moderate	13.4%
5	347		
6	242		
7	559	High	4.9%
8	0		
9	0	Extreme	0.0%
10	0		
Total	11,344	-	**100%**

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. There have been nine historical fires in the AOI; in addition, the two largest fires to have burned in the AOI occurred in 1934 which burned a total area of 424 hectares (human caused) and in 1952 which burned a total area of 152 hectares (miscellaneous cause). This historical fire data demonstrates that the vast majority of fires in and adjacent to the AOI occurred due to human activity and that there have been no large fires since the 1950s. Due to the lack of fire ignition points, no conclusions can be drawn on typical fire spread directions.



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
- 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 five field days at the end of September and beginning of October 2020, 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 study area to support development of priority treatment areas, and in order to confidently ascribe threat to polygons which may not have been visited or plotted, but which have similar fuel, topographic, and proximity to structure characteristics to those that were.

Field assessment locations were prioritized based upon:

- PSTA wildfire threat analysis class - Field assessments were clustered in those areas with wildfire threat analysis classes of 6 or higher.
- Proximity to values at risk – Field assessments were clustered in the 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.

- Observations – Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.

A total of 28 WUI threat plots were completed and over 600 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 G – Fuel Typing Methodology and Limitations, Map 7) combined with field wildfire threat assessments and office-based analysis (Appendix A-1 to A-4), local wildfire threat for the study area was updated (Table 11). Using the Wildfire Threat Assessment methodology[52], there are two main components of the threat rating system: the wildfire behaviour threat class (fuels, weather and topography sub-components) and the WUI threat class (structural sub-component).

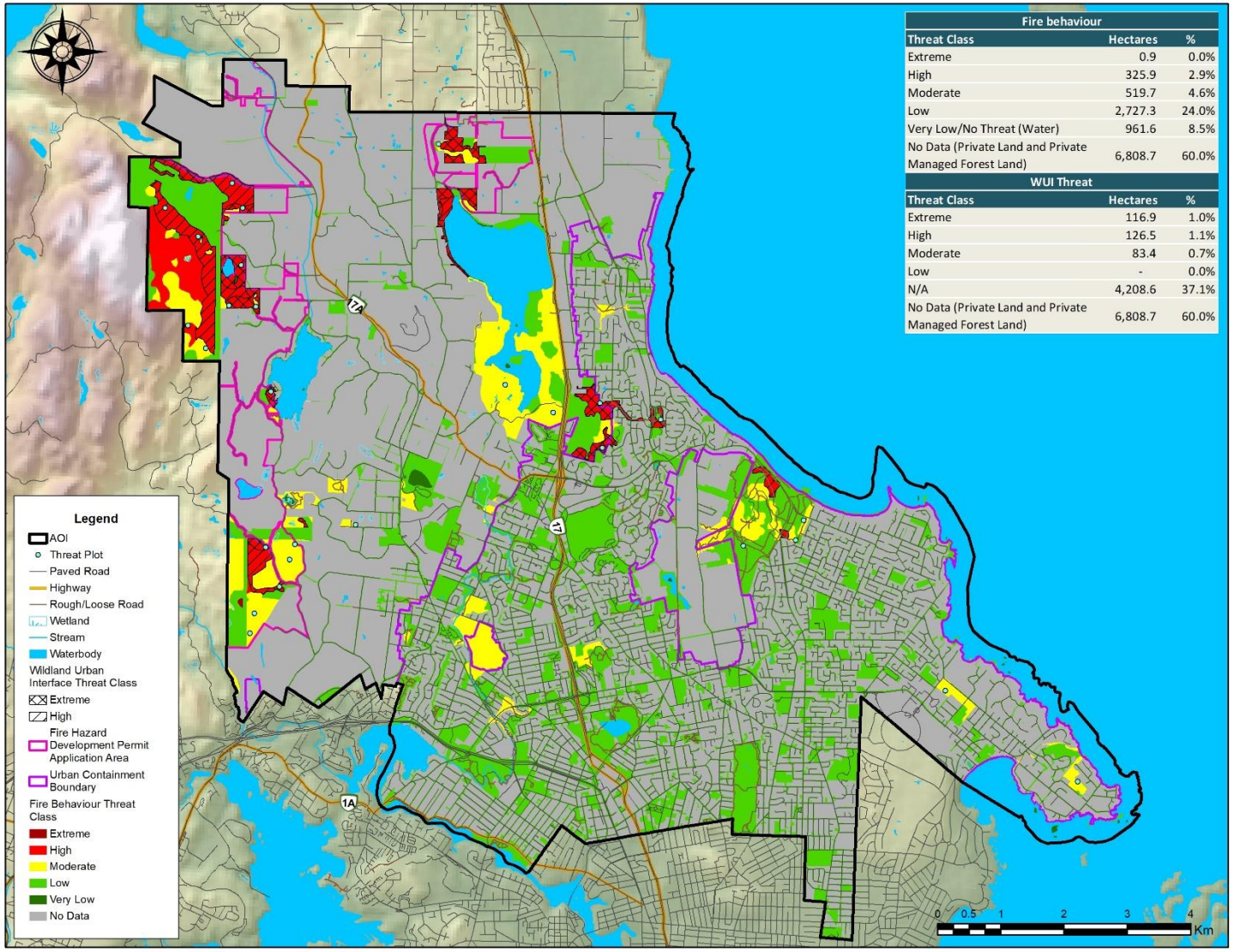
The result of the analysis shows that the study area is composed of a mix of low and moderate threat class stands. The widespread occurrence of lower threat class stands is due to the anthropogenic disturbances that have historically occurred and persist on the land base; however, some areas of high threat class rating persist in the AOI. In summary, the study area is made up of roughly 3% high threat class rating, 5% moderate, and 24% low. The remaining 69% of the AOI is classified either as very low/no threat or as private land and as such has not been allocated fire threat data. Assessment of fire threat on private land is outside the scope of this CWPP.

The areas that represent the highest wildfire behavior potential and greatest risk to values within the DOS are areas of high and extreme threat class surrounding large isolated patches of mature forest adjacent to homes and steeper terrain (Map 5). For detailed field data collection and spatial analysis methodology for the local threat assessment and classification, see Appendix H – WUI Threat Assessment Methodology.

Table 11. Fire behaviour threat summary for the study area.

Wildfire Behaviour Threat Class	2018 PSTA Data	2020 CWPP
	Percent of AOI	Percent of AOI
Extreme	0.0%	0.0%
High	4.9%	2.9%
Moderate	13.4%	4.6%
Low	17.6%	24.0%
Very Low/ No Threat (Water)	8.9%	8.5%
No Data (Private Land and Private Managed Forest Land)	55.3%	60.0%

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



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

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

5.1 FUEL MANAGEMENT

Fuel management, also referred to as vegetation management or fuel treatment, is a key element of wildfire risk reduction. For the purpose of this discussion, fuel management generally refers to vegetation/fuel modifications in forested areas greater than 30 m from homes and structures. However, given the mosaic of urbanized and natural areas within the District, the fuel treatment zone can be up to 300 m away from private property in natural areas, parkland, and greenways within the Home Ignition Zone (0-300 m buffer) or beyond.

The objectives of fuel management are to:

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

Ideally, these objectives will enhance the protection of homes and critical infrastructure from wildfire. 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.

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. Fuel management does not necessarily stop wildfire, although fuel treatments have the potential to decrease potential fire intensity and the likelihood of extreme fire behaviour, they can also increase surface wind speeds and potentially reduce fuel moisture content by opening up the canopy. Thus, fuel treatments have the potential to increase the speed at which a fire may spread across the landscape. Those undertaking the planning and implementation of fuel treatments should acknowledge this and plan accordingly.

Fuel management on municipal and First Nation land, or in Regional Parks, may be funded by the Union of BC Municipalities (UBCM), through the Community Resiliency Investment (CRI) Program. Fuel management on Provincial Crown land only may be funded by the Crown Land Wildfire Risk Reduction (WRR) funding category[53] under the CRI Program (administered by MFLNRORD). The CRI Program also provides funding for selected FireSmart activities and planning on private land.[54] The best approach to mitigate fuels on private lands is to urge private landowners to comply with FireSmart guidelines (as described below in Section 5.2) and to conduct appropriate fuel modifications using their own resources (CRI program funding may be available). In general, when considering fuel management to reduce fire risk, the following steps should be followed:

- Carefully anticipate the likely wildfire scenarios to properly locate fuel modification areas;
- Acquire an understanding of local ecological, archaeological, and societal values of the site;
- Prescriptions should be developed by a qualified professional forester working within their field of competence;
- Public consultation should be conducted during the process to ensure community support;
- Potential treatment areas and draft prescriptions should be referred to First Nations with sufficient time for meaningful review and input (45-60 days, preferably);
- 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 CWPP include the use of fuel breaks and fuel treatment polygons, as defined in Section 5.1.1, to reduce the wildfire potential within and around the AOI. Potential treatment activities include surface fuel removal, thinning of stems (usually smaller diameter), stand conversion of tree vegetation from coniferous to deciduous, pruning, and chipping, or a combination of two or more of these activities. Stand conversion encourages forests with a higher

[53] Crown Land WRR is a recently introduced category of CRI Program funding for risk reduction activities on provincial Crown Land effective 2020 that will be led by MFLNRORD (in partnership with local government and others) for wildfire risk reduction activities targeting provincially identified critical infrastructure, and treatment activities on provincial Crown land around communities.

[54] CRI FireSmart Community Funding & Supports – Program & Application Guide. 2020. Retrieved from: https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2020-program-guide.pdf

proportion of deciduous trees, and has been shown to be effective at reducing wildfire potential in mixed-wood or conifer dominated stands. This approach generally involves the retention of broadleaf species (i.e., deciduous); and targeting the removal of conifer species by thinning small or suppressed tree stems to reduce ladder fuels and prevent tree crowns from overlapping and touching one another.

5.1.1 Proposed Treatment Units

Funding opportunities from UBCM under the 2021 CRI Program, specifically under the FireSmart Community Funding and Supports (FCFS) program, will consider fuel management activities in Regional District parks, on municipal Crown land, or First Nations land within the municipal boundary. Fuel treatments that represent contiguous, logical units that extend onto Crown land or outside of local government boundaries may also be considered for funding through the CRI Program if the fuel management activities are adjacent to community structures and the units extend no further than 1 km from the structure density threshold, as defined by the CRI Program. All units proposed herein are located on municipal Crown land and/or are located adjacent to community structures. Eligible activities include development of fuel management prescriptions, as well as operational implementation of those plans (treatments).[55]

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

Funding for fuel treatments located exclusively on Crown land, outside of municipal boundaries, Regional District parks or First Nations land is administered through MFLNRORD under the Crown Land Wildfire Risk Reduction (WRR) program.[56]

The potential treatment areas represent high or extreme fire hazard areas which are close to values at risk (structures or infrastructure) or have been identified as landscape level fuel breaks. 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 units 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).

[55] The 2021 CRI program guide is available at https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html

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

Although potential treatment areas have been ground-truthed during field work, additional refinement of the polygons will be required at the time of prescription development. Prescription development must be carried out by a qualified forest professional and will require detailed site-level assessment to stratify treatment areas (and areas of no treatment), identify values and constraints, and engage all appropriate provincial agencies, First Nations, and stakeholders.

Recommended potential treatment areas within the AOI are outlined in Table 12 and displayed in Map 6. Fuel treatment opportunities may be fuel breaks (linear, beginning and ending at an anchor point, and a minimum of 1 km where possible) or polygon treatments (not necessarily forming a continuous fuel break unit or tied into an anchor point).[57] Potential fuel treatment units recommended within the plan are a combination of linear and polygon treatment units. Linear fuel breaks may require collaborative effort with multiple landowners and licensees.

Fuel Treatment Types

The intent of establishing a fuel break (or fuel polygon) is to modify fire behaviour and create a fire suppression option that is part of a multi-barrier approach to reduce the risk to values (e.g., structures). A fuel break, in and of itself, is unlikely to stop a fire under most conditions, but rather should be designed to transition and keep the crown fire to the surface where wildfire crews have suppression opportunities.[58] 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 recommended guidelines 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 (fuel breaks and fuel polygons), and
- applying FireSmart recommended guidelines to structures and the surrounding vegetation.

Fuel treatment units require periodic maintenance to retain their effectiveness.

It should be noted that BC Hydro transmission lines across the AOI can act as fuel breaks if regular brushing, and removal of regenerating conifers, and woody surface debris accumulations occurs. In addition, flammable invasive species such as Scotch broom (*Cytisus scoparius*) should not be allowed to establish en masse, nor should the biomass from woody perennials and shrubs accumulate as these represent flashy fuels. During field assessments the fuel types noted in the right-of-way included N (non-

[57] https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/2020_fuel_management_prescription_guidance_final.pdf
[58] BC Wildfire Service. 2020. 2020 Fuel Management Prescription Guidance. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/2020_fuel_management_prescription_guidance_final.pdf

fuel), D-1/2 (deciduous), and M-1/2 (a mix of deciduous and coniferous with the coniferous component comprising 25% or 50%). These fuel types are considered low hazard.

Interface Fuel Breaks

Fuel breaks on Crown or municipal land immediately adjacent to values are termed interface fuel breaks. These are designed to modify fire behaviour, create fire suppression options, and improve suppression outcomes. Interface fuel breaks 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 human-constructed 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 break and structures should be treated according to FireSmart vegetation management standards. Structures in interface areas should be constructed or retrofitted to FireSmart design standards.

Primary Fuel Break

Primary fuel breaks are located in strategic locations beyond the interface fuel treatments. Primary fuel breaks are designed to modify fire behaviour and create fire suppression options that reduce the risk of a crown fire reaching a community and/or adjacent private lands. Primary fuel breaks may be located to completely surround a community or be strategically placed upwind of communities and perpendicular to fire season winds. Primary fuel breaks have sufficient width and appropriate fuel reduction measures to break the crown fire threshold and reduce fire intensity such that overstory fire moves to the ground surface and spread rates are reduced. While there are no absolute standards for fuel break width or fuel manipulation in the literature, distances will vary based on fuel type, topography, and expected fire behaviour. [59] A 300-meter fuel break width is generally recommended. The spotting and fire suppression concerns with regards to primary fuel breaks are the same as the ones described for interface fuel breaks.

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

Table 12. Proposed Treatment Area Summary Table.

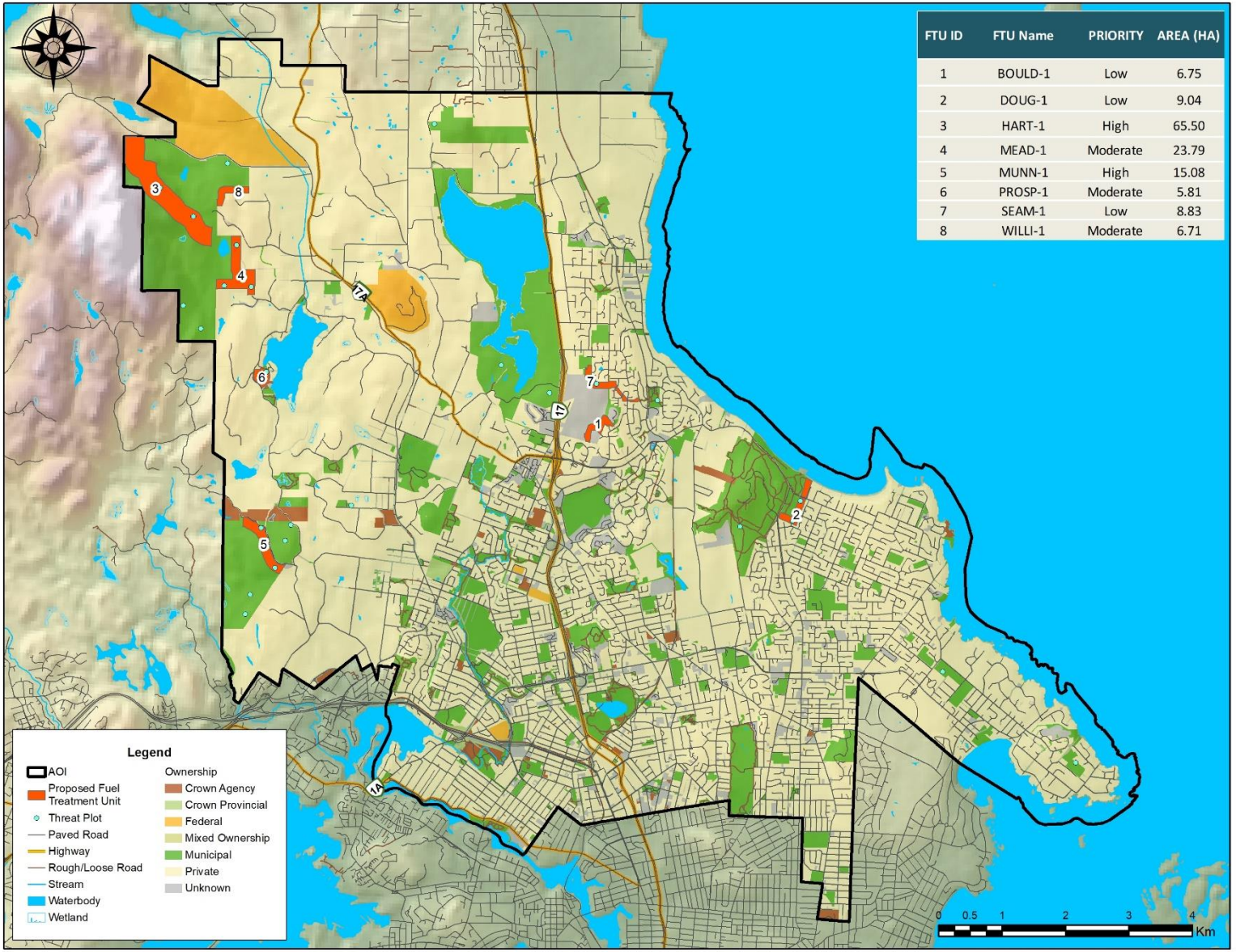
PTU #	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
***All Proposed Treatment Units (PTUs) are within the Victoria/Saanich landscape unit which is a part of the South Coast Natural Resource District and is guided by the Vancouver Island Land Use Plan. All PTUs are overlapped by the Arrowsmith TSA and guide certificate number 100677 which is operated by Edward Chappel and Daren Deluca. All of the PTUs belong within the coastal Douglas-fir moist maritime (CDFmm) biogeoclimatic zone. Due to the presence of archeological site occurrences within the AOI, an archeologist and all affected First Nations must be consulted with during prescription development and prior to implementation.*								
1	Boulderwood Hill Park (BOULD-1)	Low	6.75	Interface	6.47	0.10	0.17	This PTU is overlapped by Boulderwood Hill Park and the Colquitz River watershed. This PTU overlaps with one occurrence of a species at risk, the Propertius duskywing (*Erynnis propertius*) butterfly, and two ecosystems at risk: grand fir/ three-leaved foamflower (*Abies grandis/ Tiarella trifoliata*) and western redcedar/ Indian-plum (*Thuja plicata/ Oemleria cerasiformis*). Consultation with a qualified wildlife biologist/ecologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within Boulderwood Hill Park and is intended as a 100 m reduced-fuel buffer behind residential areas. This PTU is characterized by a C-3 stand with heavy surface fuel loading; 0.5 kg/m^2 fine woody debris (FWD), 1.0 kg/m^2 medium woody debris (MWD), and 0.40 kg/m^2 coarse woody debris (CWD). The overstory is composed of dead and dying Douglas fir which is expected to continue to contribute to surface fuel loading into the future. The crown base heights of mature trees are relatively low and denser patches of cedar regeneration are present creating potential for a surface fire to ladder into the crowns of mature trees in the stand. Horizontal fuel continuity is scattered due to rockier knolls with limited conifer growth. Recommended treatments include removal of understory conifers, pruning to increase crown base height, and removal of excess surface fuels.

PTU #	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
2	Mount Douglas Park (DOUG-1)	Low	9.04	Interface	0.91	3.02	0.0	This PTU overlaps Mount Douglas Park and watershed #37083. This PTU overlaps with five ecosystems at risk: Douglas-fir/arbutus (*Pseudotsuga menziesii- Arbutus menziesii*), western redcedar/ Indian-plum (*Thuja plicata/ Oemleria cerasiformis*), western redcedar/ vanilla-leaf (*Thuja plicata/ Achylls triphylla*), red alder/ slough sedge [black cottonwood] (*Alnus rubra/ Carex obnupta [Populus trichocarpa]*), and Douglas-fir/ dull Oregon-grape (*Pseudotsuga menziesii/ Barberis nervosa*). Consultation with a qualified ecologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located in Mount Douglas Park and is intended as a 100 m reduced-fuel buffer between hazardous vegetation and residential areas. This treatment unit is characterized by a C-3 stand that is dominated by dead and dying conifers (cedar and Douglas fir) in the overstory due to drought and root rot centers, and dense thickets of conifer regeneration in the understory due to large gap openings. Ladder fuel continuity is also high due to low crown base heights of conifers. Fine surface fuel loading is also high due to green waste dumping and fallen dead branch and leafy materials from dead/dying overstory conifers. The understory vegetation is composed of deciduous shrubs and includes thick oceanspray, shrubby deciduous trees, and young conifers. Treatment recommendations include surface fuel removal, thinning from below and pruning.
3	Hartland Landfill (HART-1)	High	65.5	Interface	39.52	3.82	22.17	This PTU is completely overlapped by the Tod Creek watershed. This PTU overlaps with one species at risk occurrence of Western Screech-Owl, *kennicottii* subspecies (*Megascops kennicottii kennicottii*). Consultation with a qualified wildlife biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is intended as a 300 m interface buffer located along the south perimeter of the Hartland landfill. This PTU is characterized by a C-3 fuel type composed of mature Douglas fir, cedar and arbutus in the overstory and young cedar and shrubby oceanspray in the understory. Crown closure is approximately 65%, with many of the conifers in the overstory being standing dead and dying due to drought and root rot centers. The partially dead and standing dead trees behave as elevated fuels; as a result, horizontal fuel continuity is patchy but ladder fuel continuity is high. In addition, these standing dead/dying trees significantly contribute to high surface fuel loading due to dead leafy/branch materials (FWD 1.8 kg/m^2, MWD 5.0 kg/m^2, and CWD is 1.5 kg/m^2). Recommended treatments in order of highest priority, include; surface fuel removal, thinning from below, and pruning.

PTU #	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
4	Killarney Lake (MEAD-1)	Moderate	23.79	Interface	20.98	2.07	0.74	This PTU is overlapped by Mount Work Park and the Tod Creek watershed. This PTU overlaps with proposed critical habitat for federally listed species at risk. This PTU overlaps with two ecosystems at risk: Douglas-fir/ dull Oregon-grape and grand fir/ dull Oregon-grape. This PTU also overlaps with the yellow-listed California tea plant. Consultation with a qualified ecologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located in Mount Work Park and is characterized by a C-3 fuel type. The overstory species composition includes mature Douglas fir and cedar with high and low crown base heights. The understory is dominated by suppressed cedar and deciduous shrubs such as oceanspray. Ladder and horizontal fuel continuity is patchy and is composed of elevated dead branches and suppressed understory vegetation. Surface fuel loading is high in this stand; FWD is 0.70 kg/m^2, MWD is 1.2 kg/m^2 and CWD is 0.80 CWD kg/m^2. The total standing dead within the stand is between 25%-30% due to root rot disease and drought. Recommended treatments include thin-from-below, prune (to a minimum height of 3 meters) and surface fuel removal.
5	Munn Road (MUNN-1)	High	15.08	Primary	5.80	1.29	0.0	This PTU overlaps with watershed #37198 in the south and the Tod Creek watershed in the north. This PTU also overlaps with proposed critical habitat for federally listed species at risk. This PTU is overlapped by the western screech-owl, *kennicotti* subspecies (*Megascops kennicottii kennicottii*) habitat, and two red listed ecosystems; western redcedar/ vanilla-leaf (Thuja plicata/ Achylys triphylla) community and the Garry oak/ oceanspray (*Quercus garryana/Holodiscus discolor*) community. Consultation with a qualified wildlife biologist and an ecologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is intended as a 150 m reduced-fuel buffer along the south side of Munn Rd and is a primary fuel break. This PTU is characterized by rolling terrain, high recreation use and high traffic use. The stand type is characterized by a C-3 stand with patches of C-5 and M-1/2 fuel types. The C-3 stand is characterized by mature Douglas fir and cedar with low crown base heights. Horizontal fuel continuity is patchy and moderate ladder fuels due to young cedar regeneration that are reaching into the crown base heights of mature trees. Crown closure is high at 80% and surface fuel loading is considerable due to blowdown and dead fallen branch and leafy materials (FWD 2.0 kg/m^2, for MWD 2.7 kg/m^2 and CWD is 0.4 kg/m^2). Recommended treatments in order of highest priority, include; surface fuel removal, pruning, and thinning from below.

PTU #	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
6	Prospect Lake Park (PROSP-1)	Moderate	5.81	Interface	2.46	0.12	3.23	This PTU is overlapped by Prospect Lake Park and the Tod Creek watershed. This PTU overlaps with proposed critical habitat for federally listed species at risk. This PTU partially overlaps the Douglas-fir/ dull Oregon-grape ecosystem at risk. Consultation with a qualified wildlife biologist and an ecologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located in Prospect Lake Park and is intended as a 100 m reduced-fuel buffer between private homes and hazardous vegetation. This fuel type is characterized by a wetter site C-3 stand with dense conifer understory growth. The overstory is composed of mature red alder and cedar with layering lower branches and dense understory conifer regeneration (cedar), as a result horizontal and ladder fuel continuity is high. Due to a high-water table within the stand, cedar blowdown is quite prevalent and significantly contributes to elevated fuels and CWD surface fuel loading. Crown closure is relatively high (70%) with some gaps in the canopy due to windthrow, and surface fuel loading is dominated by FWD and litter. Recommended treatments in order of highest priority include pruning, thinning from below, and surface fuel removal.
7	Seamist Place (SEAM-1)	Low	8.83	Interface	8.42	0.0	0.41	This PTU overlaps with a tenure notation-of-interest for a watershed reserve, the Colquitz River watershed in the west, and watershed #37083 in the east. This PTU overlaps with two ecosystems at risk: grand fir/ three-leaved foamflower (*Abies grandis/ Tiarella trifoliata*) ecosystem and western redcedar/ Indian-plum (*Thuja plicata/Oemleria cerasiformis*). Consultation with tenure holders and a qualified ecologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is intended as a 100 m wide interface buffer between residential communities and flammable vegetation. This PTU is characterized by a C-3 fuel type that is composed of dense patches of cedar regen and mature Douglas fir and cedar and more open and rocky patches of mature arbutus and Douglas fir. Due to the multiple age classes within the stand, horizontal and ladder fuel continuity is high. Surface fuel loading is also high due to green waste dumping and fallen branch materials from overstory conifers. Blowdown has also affected this stand resulting in increased CWD on the forest floor and large gap openings that have allowed for thick understory regen (typically with a density >2000). Due to unsanctioned green waste dumping, slash-like conditions exist behind many private properties. These patches of high surface fuel loading in combination with high density stands, low crown base height and high ladder and horizontal fuel continuity increase the risk of crown fires. Treatment recommendations include thinning from below, surface fuel removal and pruning (all high priority).

PTU #	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
8	Willis Point Road (WILLI-1)	Low	6.71	Interface	4.40	1.90	0.41	This PTU is overlapped by the Tod Creek Watershed and two ecosystems at risk: grand fir/ dull Oregon-grape and Douglas-fir/ dull Oregon-grape. Consultation with a qualified ecologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located to the east of the Hartland Landfill and is intended as a 100 m reduced-fuel buffer between private homes and flammable vegetation. This PTU is characterized by a C-3 stand composed of mature Douglas fir and cedar (with low crown base height) and mature arbutus. The understory is dense and shrubby and is composed of mosses (which when dry, can act as flashy surface fuels), salal, sword fern and oceanspray. The understory stem density is 1500 stems per hectare (sph), crown closure is 70% and slope is between 20-30%. Within this stand tree mortality is expected to increase due to drought and root rot centers which will contribute to surface fuel loading. Treatment recommendations include removal of understory conifers, pruning of overstory ladder fuels to 3 m height and surface debris removal.



Map 6. Proposed Fuel Treatments

5.1.2 Maintenance of Previously Treated Areas

As no fuel treatments have occurred within the DOS, maintenance activities of previously treated areas are not applicable. However, if fuel treatments occur in the DOS 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 sites require treatments more often.

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 in the future.

5.2.1 FireSmart Goals and Objectives

FireSmart® is the comprehensive nationally accepted set of principles, practices and programs for reducing losses from wildfire.[60] 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.

The FireSmart approach and concepts, including recommended FireSmart guidelines,[61] have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000; FireSmart has become the de facto Canadian standard. FireSmart is founded in standards published by the National Fire Protection Association (NFPA). The objective of FireSmart is to help homeowners, neighbourhoods, whole communities and agencies with fire protection and public safety mandates to work together to prepare for the threat of wildfire in the WUI. Coordinated efforts between all levels of planning and action are integral to effectively and efficiently reducing the risk to communities.

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

The following are key principles of FireSmart:

- Wildland fires are a natural process and critical to the health of Canadian ecosystems;
- Mitigation and response efforts must be carefully coordinated through all stages of planning and implementation;

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

[61] 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

- Threats and losses due to wildfires can be reduced by working together. Responsibility for effectively mitigating hazards must be shared between many entities including homeowners, industry, businesses and governments;[62]
- There are seven broad disciplines to help address the threat of wildfire: education, vegetation management, legislation and planning, development considerations, interagency cooperation, emergency planning, and cross training; and,[62]
- Solutions are required at all scales from individual backyards, to communities and the wider landscape. In order to succeed, these efforts must be integrated across the mosaic of land ownership (Figure 2).

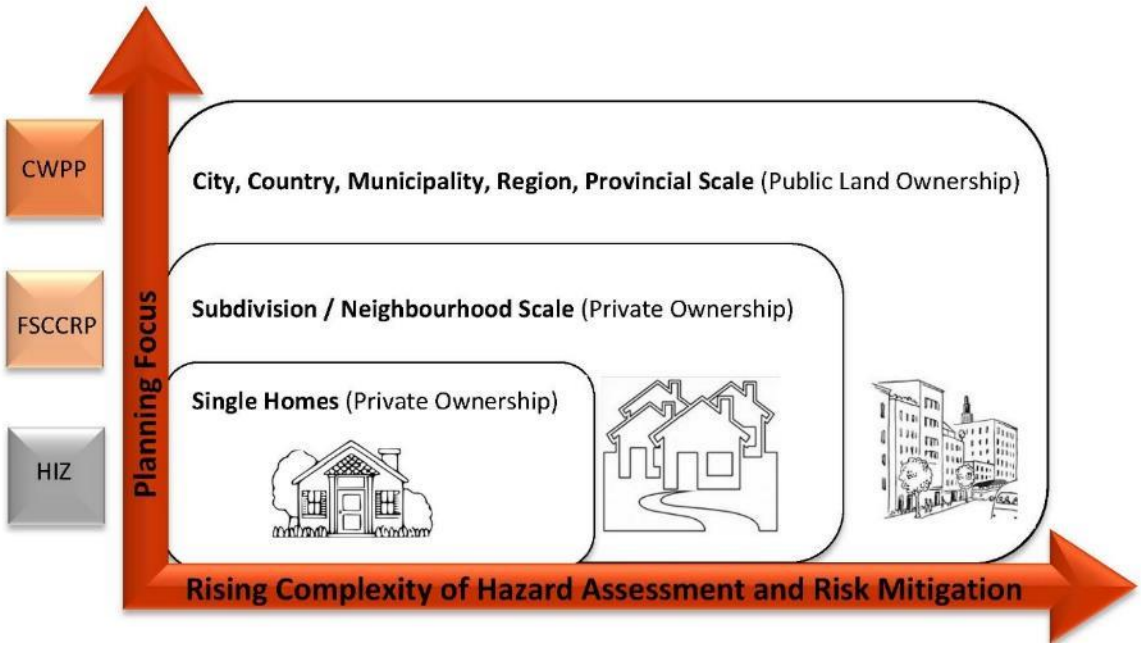


Figure 2. Diagram of the various, coordinated levels of the FireSmart program.[63] CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

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;[64]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 (a drier ecosystem than the Coastal Douglas-fir ecosystem that is found within Saanich), indicate that the vast majority of initial home ignitions in the WUI were caused by embers rather than direct contact by flames or radiant

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

heat.[65] Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire threat surrounding them.[65]

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;
- Treat fuel adjacent and nearby to structures to reduce the probability of ignition from radiant heat, direct flame contact and ember transport; and,
- Implement measures to structures and assets that reduce the probability of ignition and loss.[66]

Home Ignition Zone

Multiple studies (including the previously referenced Fort McMurray WUI fire investigation, which occurred in a drier ecosystem than the District of Saanich and with fewer firefighting resources) have shown that the principal factors regarding home loss to wildfire are the structure's characteristics and immediate surroundings and the area that determines the ignition potential is referred to as the Home Ignition Zone (HIZ).[67,68] The HIZ includes the structure itself and four concentric, progressively wider Priority Zones. HIZ Priority Zones are based upon distance from structure: 0 to 1.5 m (Priority Zone 1a-fuel free zone), 0 – 10 m (Priority Zone 1), 10 – 30 m (Priority Zone 2), and 30 – 100 m (Priority Zone 3). These zones help to guide risk reduction activities, with recommended FireSmart guidelines being most stringent closest to the structure. The likelihood of home ignition is mostly determined by the area within 30 m of the structure (Priority Zones 1a, 1 and 2). Recommended FireSmart guidelines address a multitude of hazard factors within the HIZ: building materials and design; vegetation (native or landscaped materials); and, the presence of flammable objects, debris, and vulnerable ignition sites. More detail on priority zones can be found in the FireSmart Manual.[69]

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

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[65] 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.

[66] Community Resiliency Investment Program. 2018. Community Wildfire Protection Plan Template.

[67] 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.

[68] Cohen, J. 2000. Preventing Disaster Home Ignitability in the Wildland-urban Interface. Journal of Forestry.98 (3), 15 - 21.

[69] https://firesmartcanada.ca/ and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart

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.[68] Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do not necessarily result in WUI fire disasters.[70] It is for this reason that the key to reducing WUI fire structure loss is to reduce home ignitability; mitigation responsibility must be centered on homeowners. Risk communication, education on the range of available activities, and prioritization of activities should help homeowners to feel empowered to complete simple risk reduction activities on their property.

FireSmart Canada Neighbourhood Recognition Program

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 Neighbourhood Recognition Program (FSNRP Program) is a 5-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, and 4) overwhelms suppression efforts and capabilities, and 5) leads to unprotected homes, and therefore 6) considerable structure loss. Figure 3 illustrates that it is possible to break up the disaster sequence by decreasing the number of highly ignitable homes exposed to embers, therefore reducing the number of homes ignited and removing the consequences of multiple structures lost.

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.[71]

The District of Saanich is well resourced with fire suppression staff and equipment; however, FireSmart leads to communities that are better adapted to wildfire, more resilient and able to recover following

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

[71]Calkin, D., J. Cohen, M. Finney, M. Thompson. How risk management can prevent future wildfire.

wildfires by sustaining fewer losses and disruption, and safer places to live and recreate. Action by homeowners is the number one priority for reducing structure loss in the event of a WUI fire, but the overall adaptation of the community to wildfire is a multi-pronged approach.

Figure 3. The wildland/urban interface disaster sequence and the possibility to break up the disaster sequence by decreasing the number of highly ignitable homes.[72]

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 DOS 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, local businesses, elected officials, 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 an 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 potential vulnerability of individual houses to wildfire.

The DOS has undertaken substantial public outreach in the community and online. The DOS recently held a FireSmart campaign in May 2020 via social media and traditional print newspapers, targeting residents

[72]Graphic adapted from Calkin et. al, by A. Westhaver.

in Rural Saanich. FireSmart outreach and community engagement typically occurs on an annuall basis, during the spring season in the District. In the past, FireSmart public education materials have been distributed at community events and during public presentations to the Prospect Lake Community Association. Furthermore, FireSmart assessments have been performed by staff for residents in the past. The District of Saanich Fire Department (SFD) has also partaken in community events to inform the public about fire prevention and education and held public tours of the fire hall to the public. The SFD also posts a fire danger rating sign at the base of Mount Douglas, a popular hiking trail for residents within the CRD. The Regional District is currently completing a region wide FireSmart assessment of all 13 municipalities and EAs within the CRD and establishing a regional FireSmart committee.

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 DOS are:

- To implement strategies and actions from the Climate Plan and to include FireSmart and wildfire prevention considerations in the Strategic Plan, Parks and Recreation Master Plan, Invasive Species Management Plan and Urban Forest Strategy Plan;
- To develop policies and practices for design and maintenance of FireSmart on publicly owned land such as community parks and open spaces and FireSmart publicly owned buildings; and,
- 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 should be incorporated at the plan review stage for new permits within the AOI and 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 DOS are:

- To utilize regulatory and administrative tools to reduce wildfire hazard on private land and increase the number of new developments compliant with FireSmart guidelines (with low ignition potential);
- To continue to ensure that local bylaws and plans incorporate FireSmart policies as applicable to reduce wildfire hazard and include measures that address wildfire prevention and suppression in subdivision design; and,
- To continue 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 DOS with regards to vegetation or fuel management include: 1) policy development and implementation of FireSmart maintenance for community parks and open spaces; and, 2) provision of incentives (i.e., a local rebate program) and/or collection services for private

landowners with a focus on pruning, yard and thinning debris (as per FireSmart activities for private land discussed below).

An important component of FireSmart vegetation management is the disposal of woody debris incurred from fuel treatments or routine vegetation or landscape practices. Currently residents can dispose of yard and garden waste at the public works yard where the material is recycled.

Development Permit Areas for Wildfire Hazard

During field visits, no additional areas were noted that merited inclusion in the RSIFH DPA, which currently encompasses the Durrance/Heal's Range, Hartland, Prospect Lake, Munn Road, and Bear Hill neighbourhoods (see Section 2.5.3 for a description of the RSIFH DPA and Table 3. Section 2: Local Area Description Recommendations for a list of recommendations pertaining to the RSIFH DPA).

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. When the time for evacuation is limited, poor access has contributed to deaths associated with entrapments and vehicle collisions during wildfires.[73] Methods for access design at the subdivision level can provide tools that help manage the volume of cars that need to evacuate an area within a given period of time.

For new development in areas of low flow, where hydrants are limited, or where there are no pre-existing hydrants 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 DOS and the fire department prior to development approval.

The west Saanich, Prospect Lake, Beaver Lake and Elk Lake areas within Rural Saanich host significant trail infrastructure through forested areas in the western and northern region of the municipality. Any new developments in these areas could lead to an increase in the residential population, which could increase the risk of human ignitions in these greenspaces. Although some of these areas were assessed as lower hazard during the field assessment and consisted of M-1/2, C-5, and D-1/2 fuel types, the forest stand composition will change over time as the vegetation matures, conifer regeneration occurs, surface debris accumulates, and mortality occurs via natural or human-caused disturbances, possibly resulting in higher hazard fuel types requiring treatment.

[73]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

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 further enhanced by addressing/continuing the following steps:

- Conducting a comprehensive review of Emergency Management BC SPU deployment procedures for the purpose of fighting interface fires;
- Providing sprinkler kits to community residents (at a cost);
- Engaging 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;
- Participating in cross-jurisdictional tabletop exercises and seasonal readiness meetings;
- Participating in regional or multi-agency fire or fuel management tables (i.e., Community FireSmart Resiliency Committee or wildfire working group) to facilitate communication and co-operation between groups and agencies responsible for wildfire preparation and response; and,
- Providing of training and/or professional development for Local FireSmart Representatives, community champions to increase capacity for FireSmart activities.

Current local capacity for the DOS and recommendations to address any gaps are 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 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 DOS based on assessment by an internally trained Local FireSmart Representative 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. The DOS can facilitate uptake within the community by: 1) supporting and/or facilitating planning for private land (with property owners' consent); 2) offering local rebate programs to homeowners on private land who complete eligible FireSmart activities on their properties (see Table 14 for recommendations); 3) providing off-site debris disposal for private landowners who undertake their own vegetation management (with a focus on pruning, yard and thinning). Off-site debris disposal options include providing a dumpster and/or chipper; providing curbside debris pick-up; and, waiving tipping fees. Planning for private land may include developing FireSmart Neighbourhood Plans for identified areas (i.e., a WUI neighbourhood, or subdivision) and conducting FireSmart home and property assessments.

FireSmart Compliance within the Area of Interest

There is a wide range of compliance with FireSmart guidelines on private property in the AOI, variability in compliance also exists between building and landscape FireSmart requirements. Generally, homes in the RSIFH DPA do maintain a 10 m defensible space. However, there is inconsistent compliance with landscaping guidelines and storage of combustible materials such as firewood. In comparison, most

residences within the UCB are surrounded by mowed and maintained lawns, and/or hardscaping (driveways, sidewalks and rocks), which are all FireSmart compliant.

Aside from differing levels of individual private property owners' compliance with FireSmart guidelines, there are a number of other factors that add variability to the level of overall FireSmart compliance within the AOI. Ultimately, these factors include but are not limited to: proximity to municipal greenways and densely forested park lands (a significant consideration outside of the UCB); the age of homes; prevailing design features and standardized building materials; positioning of the home or neighbourhood in relation to slope, aspect and prevailing winds; and, the stage and maturity of landscaping.

Neighbourhoods in the DOS were unofficially reviewed during field work. The following observations were made:

- Wildfire hazard levels range from low (urban Saanich) to high (Rural Saanich) across neighbourhoods within the AOI;
- The bulk of hazards are associated with natural and landscaped vegetation immediately surrounding residential properties, especially in Rural Saanich;
- For new developments, public education in combination with enforcement of the RSIFH DPA may aid in promoting fire resistant landscaping options and achieving defensible space in the HIZ;
- Hazards may be magnified in some neighbourhoods due to poor access (i.e., presence of one-way access roads), or by being outside of the water service area; nevertheless,
- All neighbourhoods have good opportunities to mitigate risk through individual and collective action.

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 DOS 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 DOS conduct their own interdepartmental review to refine the areas in

Table 13.

Table 13. Summary of FireSmart Priority Areas.

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #1: Western side of Prospect Lake and surrounding Killarney Lake along Meadowbrook Road, Petworth Drive, Kerryview Drive and Heartland Avenue.	N	N	The following is a non-extensive list of FireSmart activities for which the DOS can engage suggested neighbourhood residents:

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #2: Homes east of Prospect Lake along Goward Road, Stevens Road and Excelsior Road.	N	N	1) Provide guidance to ensure landscaping is to an established FireSmart standard[74];
Priority Area #3: Homes surrounding Bear Hill Park, especially along Bear Hill Road, Brookleigh Road, Batu Road and Central Saanich Road.	N	N	2) Incentivise private landowners to engage in retrofitting homes with building materials and design based on NFPA 1144 or FireSmart standards;
Priority Area #4: Residential areas surrounding Hector Road, Uberto Road, Ivor Road, Conway Road, Viaduct Avenue West and Interurban Road.	N	N	3) Encourage prompt removal of combustible construction materials or yard waste from private properties; and,
Priority Area #5: Homes north of the Dominion Astrophysical Observatory especially along Spartan Road, Old West Saanich Road and Linnet Lane.	N	N	4) Coordinate monthly or bi-monthly yard waste removal days prior to and during the fire season to reduce WUI fire hazard.
Priority Area #6: Residential areas south of Mount Douglas Park, especially along Parkside Crescent, Glendenning Road, Cedar Hill Road, Robinwood Drive and Edgemont Road.	N	N	
Priority Area #7: Homes within the Cadboro Bay area especially surrounding Konukson Park and along Queenswood Drive, Tudor Avenue, Seapoint Drive, Arbutus Road and Phyllis Street.	N	N	Based on field observations, the majority of all critical infrastructure has FireSmart setbacks from forested areas. Consider conducting FireSmart treatments to ensure the wildfire risk does not reach higher than moderate. 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.

[74] FireSmart Canada. FireSmart Guide to Landscaping, Second Edition (2020). Retrieved from: https://firesmartcanada.ca/wp-content/uploads/2020/06/328254-PIP-Landscape-low-res.pdf. Note, a guide specific to BC is slated for release by FireSmart BC in the spring of 2021.

5.3 COMMUNICATION AND EDUCATION

Establishing effective communications and actively engaging key stakeholders in risk reduction activities are keystones to building a FireSmart community. Residents, businesses, public officials and industry should work together to reduce the risk of potential property damage due to wildfire. In many communities, there is a general lack of understanding about interface fire, the relationship between ignition potential and potential loss of homes, and the simple steps that can be taken to minimize risk on private land. In addition, public perceptions regarding responsibility for risk reduction and the ability of firefighters to safely intervene to protect homes during a wildfire are often underdeveloped or inaccurate.

Based on the consultation completed during the development of this CWPP, it is evident that DOS staff and some residents have a good level of awareness of interface fire risk. 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. Communication and education objectives for the DOS 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.

Significant areas of private land in the DOS [are within the ALR], supporting a range of crop and livestock [large scale and hobby] agriculture production. The agriculture sector faces unique challenges with respect to wildfire planning and preparedness (including but not limited to livestock relocation). Consequently, the Climate & Agriculture Initiative (CAI) BC, in collaboration with partners and through workshops delivered in various agriculture communities in BC, has developed wildfire planning resources specific to the agriculture sector.[75] 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 (See

[75] Wildfire Preparedness and Mitigation Plan – Guide and Workbook, which can be accessed online here: https://www.bcagclimateaction.ca/library/wildfire-preparedness/.

Table 14 for recommendations).

5.4 OTHER PREVENTION MEASURES

In addition to fuel treatment and community communication and education, fire prevention in the AOI is also addressed via the following avenues: 1) public display of danger class rating signs, which should be updated on a weekly basis; 2) fire ban alignment with provincial fire bans; 3) potential enforcement of restricted access to certain park areas similar to provincial requirements; and, 4) enforcement of local bylaws such as the Fire Prevention 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.

Several fire danger rating signs are located within the DOS at Fire Hall #1, #2, #3, at the east entrance to Mount Douglas Park, and at the junction of the Lochside Trail, and Galloping Goose Trail. These signs are updated daily by the SFD staff during the fire season.

In addition to human-caused fire starts, 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 DOS, BC Hydro, and any other pertinent industrial partners.

Table 14. Section 5: Risk Management and Mitigation Factors Recommendations

Item	Recommendation / Next Steps
RECOMMENDATION #7	Proceed with detailed assessment, prescription development, and treatment of proposed treatment units identified and prioritized in this CWPP.
RECOMMENDATION #8	Promote existing green waste disposal programs within the DOS, for example curbside pick-up and free drop-off within the region.
RECOMMENDATION #9	The DOS should consider applying for funding from the UBCM CRI Program to develop a FireSmart local rebate program. This program will allow homeowners to access partial rebates for FireSmart activities on their properties, if rated as high or extreme risk in a FireSmart home and property assessment. Activities could include installation of FireSmart roofing or windows, woodshed relocation and closing of open decks. Prioritize offering the program to residents in Rural Saanich. A Local FireSmart Representative could be engaged part-time to deliver the program. Consideration should be made to allow for interdepartmental input.
RECOMMENDATION #10	The DOS should continue to train additional Fire Prevention staff as Local FireSmart Representatives (LFRs) to increase organizational knowledge in this area and to support ongoing public education and wildfire risk mitigation. In order to increase public uptake and participation, future initiatives should focus efforts following an active fire season in BC to maximize the resources available for community engagement.
RECOMMENDATION #11	Consider including a Wildfire session in the annual joint Fire Safety Symposium between the Fire Departments from the Districts of Saanich, Central Saanich, North Saanich and Sidney. Consider involvement from Association of BC Forest Professionals (ABCFP) and BCWS (Coastal Fire Centre) staff.
RECOMMENDATION #12	Encourage the Saanich School District (#63) to continue to adopt and deploy existing wildfire education programs to Grade 5 students. There is emergency preparedness curriculum available provincially, which includes preparedness for a variety of natural hazards, including wildfire
RECOMMENDATION #13	The DOS should expand on the information currently available on the Wildfire Protection page of the DOS website, including links to more wildfire prevention resources and information pertaining to Rural Saanich (also see recommendation #18 for resources specific to the agriculture sector).
RECOMMENDATION #14	This CWPP report and associated maps should be made publicly available through a dedicated webpage on the District's website. In addition, this CWPP should be shared with utility partners (i.e., BC Hydro) who may be interested in collaborating on fuel treatments.
RECOMMENDATION #15	Continue implementing the DOS social media strategy to update social media platforms regularly during the fire season to ensure that fire bans, high or extreme Fire Danger days, wildfire prevention initiatives and FireSmart activities are communicated to residents.
RECOMMENDATION #16	Given the high public and recreational usage of parks and trails along the western and northern portion of the AOI, the DOS and SFD in collaboration with the Fire Protection Officers Association and/or surrounding municipalities and the CRD should develop public education focused on increasing awareness of good wildfire prevention practices.

Item	Recommendation / Next Steps
RECOMMENDATION #17	The SFD in coordination with the Saanich Emergency Program (SEP) should consider installing additional fire danger rating signs at key locations in the AOI. Signage should be updated regularly with current fire danger ratings during the peak wildfire season (May through to October).
RECOMMENDATION #18	Promote improved planning and preparedness of agriculture producers and livestock owners in the DOS and encourage wildfire preparedness practices on private farm land through distribution or sharing of wildfire action planning resources prepared specifically for the agriculture sector by the Climate & Agriculture Initiative BC (i.e., on DOS website, mailouts). Resources include a Wildfire Preparedness and Mitigation Plan – Guide and Workbook, which can be accessed online here: https://www.bcagclimateaction.ca/library/wildfire-preparedness/.
RECOMMENDATION #19	The DOS should develop a wildfire and preparedness educational brochure for Rural Saanich.

SECTION 6: WILDFIRE RESPONSE RESOURCES

This section provides a high-level overview of the local government resources available for emergency response and preparedness. 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.[76] 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 DOS has access to back-up power for most of its critical infrastructure such as the Municipal Hall, police station, and all three fire halls. However, should a wide-scale power outage occur, known vulnerabilities to secondary power sources include mechanical failure and potential fuel shortages. The local government has generally not identified any major issues with water pressure within areas that have fire hydrant service, with the exception of Mount Douglas and Mount Tolmie. Furthermore, there is no domestic water service for residents within Rural Saanich, which is outside of the UCB. Specific limitations of the DOS water system with regards to wildfire suppression are detailed in Section 6.1.2.

6.1.1 Fire Department and Equipment

The SFD responds to all incidents within the municipal boundary of the DOS, including structural and interface fires. Dispatch and response services are provided by the main firehall – Fire Hall #1 which also functions as an Emergency Operations Center (EOC) in the event of an emergency. Table 15 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment. The DOS is comprised of one single fire protection area (FPA) which is under the jurisdiction of the SFD. Areas that are at higher risk to wildfire include neighbourhoods surrounding large forested areas and parks such as Mount Work Regional Park, Elk/Beaver Lake Regional Park, Francis/King Regional Park, Mount Tolmie Park and Mount Douglas Park.

The SFD has mutual aid agreements with the City of Victoria, District of Oak Bay, the District of Central Saanich, the District of the Highlands, the Township of Esquimalt and JDF EA - Willis Point. Automatic aid agreements are in place with the District of Oak Bay and the District of Central Saanich. These mutual and automatic aid agreements are used on a frequent basis. WUI fire events may also lead to aid requests from the BCWS, and alternatively BCWS may request the aid of SFD beyond the DOS FPA. The BCWS would assist with both ground and aviation resources if required to respond to a wildfire in the AOI. This type of

[76] 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

request would typically be initiated at the request of the SFD incident commander on the scene. The DOS reviews the Wildfire Response Policy with the BCWS annually at the start of the fire season. The CRD may also offer wildfire assistance if extra resources are needed, especially to action a fire within a CRD park, however wildfire response equipment is limited.

The SFD is staffed with 128 paid members which includes: 6 administrative staff, 99 suppression staff, 10 dispatch staff, 3 emergency program staff, 2 training staff, 6 prevention staff, 2 mechanical staff and 7 administrative support staff. The SFD is well equipped with both structural and wildland firefighting equipment, including hand tools, portable water delivery equipment, and some personal protective equipment. Although the SFD is better equipped to respond to wildfire than many urban fire departments, additional equipment needed includes additional portable pumps, portable water tanks, hand tools and personal protective equipment.

Table 15. 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 Saanich	Saanich Fire Department	3	99 full-time firefighters, 9 full-time and one part-time dispatchers, 6 admin staff, 3 emergency program staff, 2 training staff, 6 prevention staff, 2 mechanical staff and 7 admin support staff.	5 engines, 2 ladders, 1 rescue, 2 tender/tankers (10,000 lt. capacity with portable tanks), 1 wildland pickup truck (with portable and fixed fire pumps), 1 ATV, and 1 side by side. Additional wildland equipment includes a forestry kit on every frontline apparatus, 3 volume pumps (one on each tender and one on W1), 1 high pressure WICK-375 pump on W1, truck mounted Honda pump on W1 for rolling pumping ability, one 3,000 gallon drop tank, two 2,0000 gallon drop tanks (located at Fire Hall #2), one 1,000 gallon bladder on W1, on ½" forestry hose on Tender 1 and W1, 5/8" econo hose on W1 and in each forestry kit, 4 pulaski axes on W1, 8 water pump backpacks on W1, forestry nozzles and wyes on W1 and Tender 1 in each forestry kit, forestry water thieves on W1 and in each forestry kit, equipment for Superior Tanker Shuttle on Tender 1 and forestry coveralls on every frontline apparatus.

Over the previous 9 years (2011-2019), the SFD has responded to an average of 4,405 calls per year (averaged over all three fire halls from 2011 to 2019). Call-out data requests include responses to fire suppression, medical response, vehicle extraction, land and marine rescue, mutual aid agreements, mutual aid requests, hazardous materials and incidents and public service requests. The SFD also provides fire dispatch services for two client municipalities in the Capital Region.

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 supply of water is available. The Fire Underwriters Survey summarizes their recommendations regarding water works systems and fire protection requirements, in *Water Supply for Public Fire Protection* (1999).[77] Some key points from this document include the need for:

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

Water service within the AOI is an important component of emergency response in the event of a WUI fire. As previously noted in Sections 3.2.3 and 3.3.1, water service is provided by the DOS via the CRD water distribution system. For suppression within the AOI, hydrant service is provided within the UCB via 2,356 fire hydrants and in Rural Saanich via water tenders deployed from Fire Hall #2 or via drafting from natural water sources. All fire hydrants are inspected on a 2–3-year cycle depending on operational efficiencies, and rely on electrical power and pump systems. DOS pumping stations do not all have back-up power available to maintain functioning in the event of a prolonged power outage. Due to hilly topography, Mount Tolmie and Mount Douglas have lower water pressure; however, this is not of major concern considering that these areas are free from private properties and people's homes. The aforementioned areas and Rural Saanich were identified as areas that could potentially create suppression challenges in the AOI. Both the water distribution and wastewater collection systems have been mapped and are available in ArcGIS.

In the future, water supply within the DOS could become limited in summer months and water shortages could occur as climate change has the potential to affect drought periods. In the event of a prolonged drought and in areas where water supply is limited, such as Rural Saanich, the SFD has the ability to draw from natural water sources (e.g., Elk Lake and Prospect Lake).

[77]Fire Underwriters Survey, 1999. Water Supply for Public Fire Protection. Retrieved from: http://www.scm-rms.ca/docs/Fire%20Underwriters%20Survey%20-%201999%20Water%20Supply%20for%20Public%20Fire%20Protection.pdf

6.1.3 Access and Evacuation

Road networks in a community serve several purposes including providing access for emergency vehicles, providing escape/evacuation routes for residents, and creating fuel breaks. Access and evacuation during a wildfire emergency often can occur simultaneously and road networks should have the capacity to handle traffic in both directions. In the event of a wildfire emergency, the Trans Canada Hwy (Highway 1), the Patricia Bay Hwy (Highway 17) and West Saanich Road (Highway 17A) are the most direct paved access and egress routes east and west, north and south of the AOI. Paved roads such as Interurban Road, Willis Point Road and Old West Saanich Road, are major arterial roads that connect residents from the north to south and east to west within the DOS.

There are a number of areas in the District, specifically in Rural Saanich that pose evacuation and fire suppression challenges. Private properties within Rural Saanich along Meadowbrook Road, Petworth Drive, Kerryview Drive, Heartland Avenue, Goward Road, Stevens Road and Excelsior Road are particularly confined and restricted in terms of quick access and egress due to narrow and windy, single access, forested roads. Additional areas within the AOI that pose a challenge for access and egress include residential areas surrounding Bear Hill Regional Park and homes along Hector Road, Uberto Road, Ivor Road, Conway Road, Viaduct Avenue West and Interurban Road (see Section 2.2) for a detailed description of these areas.

In the event of an emergency, evacuation would be coordinated by the Saanich Police Department with additional support from the SFD and Saanich Emergency Program, as needed and available. If a wildfire were to block Prospect Lake Road, West Saanich Road or Interurban Road evacuation from the AOI would be hindered. Smoke and poor visibility, car accidents, and other unforeseen circumstances can further complicate evacuations, hinder safe passage, and limit the ability of suppression crews to respond to incidents and safely evacuate residents.

Within the AOI, especially in Rural Saanich a significant portion of private residences and critical infrastructure are reached via narrow and windy roads, which may impede suppression efforts and response times, especially homes that back onto Mount Work Regional Park, Killarney Lake Park, Francis King Park and Prospect Lake Park. Rural Saanich poses a challenge for emergency response compared to urban Saanich, where most structures are within 300 to 500 m of an arterial road. Within Rural Saanich where response times may be delayed, the District has automatic or mutual agreements in place with neighboring fire departments. These agreements allow for quick and efficient response to emergencies.

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. The DOS is equipped with a municipal Emergency Response and Recovery Plan (ERRP) and has an emergency program bylaw which enables the Saanich Emergency Program (SEP) to implement emergency plans such as the Saanich Evacuation Plan and Wildland/Urban Interface ERRP. Regionally, the District is a part of the Regional Emergency Management Partnership (REMP) which encompasses various municipalities within the CRD to enhance regional emergency planning. The REMP

collaborates with all levels of government, First Nations and special interests to address emergency management activities.[78]

In addition to higher level government planning, site specific field planning such as the modifications of walking paths and recreation trails can provide improved access for ground crews and act as fuel-free zones to help prevent the spread of ground fires. Strategic recreational trail development to a standard that supports crew access (e.g., trail widening and grading) can be used as a tool that increases the ability of local fire departments to access interface areas. In order to effectively use these trails for suppression efforts, the DOS and CRD could consider the development of a Total Access Plan in the future. This plan could be made available to SEP, SFD, DOS parks staff, and the BCWS in the event that they are aiding suppression efforts on an interface fire in the AOI.

6.1.4 Training

Provision of training opportunities for structural firefighters in the realm of wildland firefighting is critical to building capacity for suppression and emergency management at the local level. It is important for the SFD to maintain their current level of structural firefighting and increase their focus on interface training in S-100 (Basic Fire Suppression and Safety) and S-215 (Operations in the Wildland Urban Interface) wildfire suppression training, combined with mock exercises in partnership with surrounding municipalities (District of Highlands and DCS), as well as CRD emergency staff and BCWS.

All firefighters within the SFD maintain a current level of structural protection program training from the Office of the Fire Commissioner. All suppression staff are trained to NFPA 1001 standards in structural firefighting techniques, medical emergency procedures, control of hazardous materials, communication systems and more. A number of SFD staff have been previously employed by the BCWS, including chiefs, captains, and firefighters, as a result the staff are more comfortable and receptive to wildland fire fighting training. The majority of the staff have received S-100 or S-215 training. It should be noted that SPP-WFF 1 is a new S-100 equivalent course for structure firefighters only, and as such BCWS has phased out instruction of S-100 training for fire departments. SPP-WFF-1 also replaces S-185 (Fire Entrapment Avoidance and Safety) and takes only 6 hours to be delivered.[79]

In addition to regular training the SFD performs wildland training every spring and summer prior to the wildfire season. This training includes conducting mock exercises that utilize the SFD's Wildland Fire Response Guidelines; which involve sizing-up fires, the completion of an initial fire report form and knowing when to contact the BCWS Coastal fire zone for assistance when a fire is outside the capability of existing and available department resources. Training further includes the use and understanding of the six ranks of fire intensity and how to effectively partake in wildland communication such as using radios to contact BCWS dispatch. In addition, wildland training priorities include how to utilize and effectively respond to wildfires using the Mount Douglas reservoir and hydrant system, how to deploy

[78] District of Saanich, 2020. Municipal Preparedness – Planning. Retrieved from: https://www.saanich.ca/EN/main/community/emergency-program/municipal-preparedness/planning.html

[79] Office of the Fire Commissioner. 2013. SPP-WFF-1 (Wildland Firefighter Level 1), as per NFPA 1051 Level 1 standard, backgrounder.

apparatus in response to a fire emergency on Mount Tolmie and how to respond to an emergency at the Dominion Observatory, which is located on federal land, using their private hydrant system. Almost all of the training received by SFD is delivered internally; staff have expressed that they would welcome external training from the BCWS.

All SFD wildland equipment is deployed during wildland training exercises. Wildland fire fighting training involves water relays, drafting from lakes in Rural Saanich, deploying water tenders to shuttle water, and setting up various hose layouts with portable pumps.

The SFD takes pride in being recognized as a key contributor to the office of the Fire Commissioner Structure Protection Program. In 2017, the SFD deployed five separate engine companies (20 members total) who were sent to Williams Lake, 100 Mile House and Lytton to aid in the Elephant Hill fire. In addition, 5 command staff were sent on two deployments with the Saanich command vehicle to Lytton and 100 Mile House. Furthermore; a year later, two command staff received training from the office of the Fire Commissioner for structure protection deployment and an additional four members received structure protection program task force leader training. Most recently in 2020, one member was deployed as a task force leader for the Christie Mountain fires near Penticton.

The SFD is well staffed with career firefighters and has a robust recruitment, training, and development program in place which is complemented by a comprehensive officer development and training program. The department ensures continued recruitment by engaging with the community through career fairs and supports and promotes Camp Ignite in the community, which encourages the participation of both female and male high school students, in learning the fundamentals of fire fighting.

The SFD recently received full time staffing at Fire Hall # 2 to operate the tender unit which is used to provide water for fire suppression in Rural Saanich and will support wildland training within the department. The SFD noted a personnel deficiency within the training division where there is a need for more staff to provide training compliant with industry standards. SFD staff have expressed the need for additional resources to be made available for staff training.

6.2 STRUCTURE PROTECTION

Overall, the SFD is well resourced in both structural and wildland fire suppression equipment. Given the varied structure density of the DOS between urban and Rural Saanich, and the mosaic of parks, greenways and densely forested interface areas composed of hazardous fuels there is a potential risk of wildfire to structures and homes. In the event that surface fuels ignite, they would potentially have the capability of laddering into the surrounding tree crowns and spreading via a crown fire. See Section 5.1 and Map 7 for an updated map of hazardous fuel types in the AOI.

It is recommended that the SFD conduct a comprehensive review of their firefighting equipment with the findings of this CWPP to determine if the purchase of a Type II Sprinkler Protection Unit (SPU) would be beneficial to the community. SPUs can be useful tools in the protection of interface homes in the event of a wildfire, and can be mobilized to allow safe suppression activities in areas not easily accessible with engines.

An important consideration in protecting the WUI zone from fire is ensuring that homes can withstand an interface fire event. An additional resource the department can draw on are the four UBCM-owned 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. Structure protection can be augmented by 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 were built without significant consideration of interface fire, there are still ways to reduce home vulnerability. Changes to surrounding vegetation, roofing materials, siding, and decking can be achieved over the long-term through voluntary upgrades, as well as changes in bylaws and building codes. Some of these changes have already been exemplified in the DOS Fire Prevention Bylaw, Building Bylaw, and Subdivision Bylaw.

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 WUI. More details on FireSmart construction can be found in the "*FireSmart Begins at Home Manual*".[80] It is recommended that homeowners take a building envelope – out approach, that is, starting with the home and working their way out. Addressing small 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 from the Institute of Home and Building Safety (IBHS) 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 DOS are to:

- Encourage private homeowners to voluntarily adopt FireSmart principles on their properties and to reduce existing barriers to action;
- Enhance protection of critical infrastructure from wildfire (and post-wildfire impacts); and,
- Enhance protection of residential/commercial structures from wildfire.

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

Table 16. Section 6: Wildfire Response Resources

Item	Recommendation / Next Steps
RECOMMENDATION #20	The SFD should continue to meet with fire departments with whom mutual or automatic aid agreements exist to design and participate in tabletop exercises, train with wildland suppression equipment, and discuss sharing of resources during a potential wildfire event.
RECOMMENDATION #21	The SEP should continue to support the Saanich Police to operationalize the Saanich Evacuation Plan by completing mock evacuation exercises at night to mimic poor visibility from smoke conditions.
RECOMMENDATION #22	The SFD should continue to train all staff in drafting from natural water sources and the use of portable pumps through annual training in accordance with NFPA 1002 – Pump Operator Training.
RECOMMENDATION #23	The SFD should make an effort to organize annual training exercises with BCWS to improve wildfire response capabilities within the AOI.
RECOMMENDATION #24	Ensure that the SFD maintains the capability to effectively suppress wildland fires through wildfire-specific training sessions. SFD staff should continue to receive task force leader training and training that includes SPP-WFF-1 or S-100 and S-185 (combined) or, at a minimum. Consider expanding the training program to maintain a high level of member training specific to interface and wildland fires. For example, SPP-115 provides training to structural firefighters on the use of wildfire pumps and hoses (and fire service hose and hydrants) in the application of Structural Protection Units (SPUs). In addition, parks staff should receive S-100 training at a minimum, if funding allows.
RECOMMENDATION #25	Promote and provide information to residents of Rural Saanich related to residential rooftop exterior sprinklers that can be purchased and installed during the fire season. Owners should consider installing a 500 liter cistern to provide adequate water flow for sprinkler system operation without the need for electricity. This can be incorporated as part of general emergency preparedness communication.
RECOMMENDATION #26	The SFD should explore the feasibility of purchasing their own Type 2 SPU trailer to improve wildfire response (provides protection for 25-30 residences).
RECOMMENDATION #27	The District should aim to improve their level of Superior Tanker Shuttle Service (STSS) accreditation to the level required for commercial lines insurance. STSS is a recognized equivalency to hydrant protection and entails well-designed and well-documented delivery of water supplies.

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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 – Wildfire Threat Assessment Worksheets and Photos(under separate cover), plot locations are summarized in Appendix F – WUI Threat Plot Locations, and the field data collection and spatial analysis methodology is detailed in Appendix H – WUI Threat Assessment Methodology.

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.[81] 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.[82] 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.[83] Details regarding fuel typing methodology and limitations are found in Appendix G – Fuel Typing Methodology and Limitations. There are several implications of the aforementioned limitations, which include: fuel typing further from the developed areas of the AOI has a lower confidence, generally; and,

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

[82]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.

[83] 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.

fuel typing should be used as a starting point for more detailed assessments and as an indicator of overall wildfire threat, not as an operational, or site-level, assessment.

Table 17 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.[84] An M-1/2 fuel type can be considered hazardous, when representing a young conifer plantation and depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory, as well as those in the understory. Table 17 only summarizes the fuel types encountered within the AOI; as such, other FBP fuel types (i.e., C-1, C-2, C-4, S-1/2 and C-7) are not included in the summary.

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 17. Fuel Type Categories and Crown Fire Spot Potential of fuel types encountered within the AOI.

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

[84] Perrakis, D. and G. Eade. 2015. BC Wildfire Service. Ministry of Forests, Lands, and Natural Resource Operations. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description* 2015 Version.

Fuel Type	FBP / CFDDRS Description	Study Area Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels.	Surface fire spread, torching of individual trees and intermittent crowning, (depending on slope and percent conifer)	<26% conifer (Very Low); 26-49% Conifer (Low); >50% Conifer (Moderate)
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
D-1/2	Aspen (leafless and green)	Deciduous stands	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

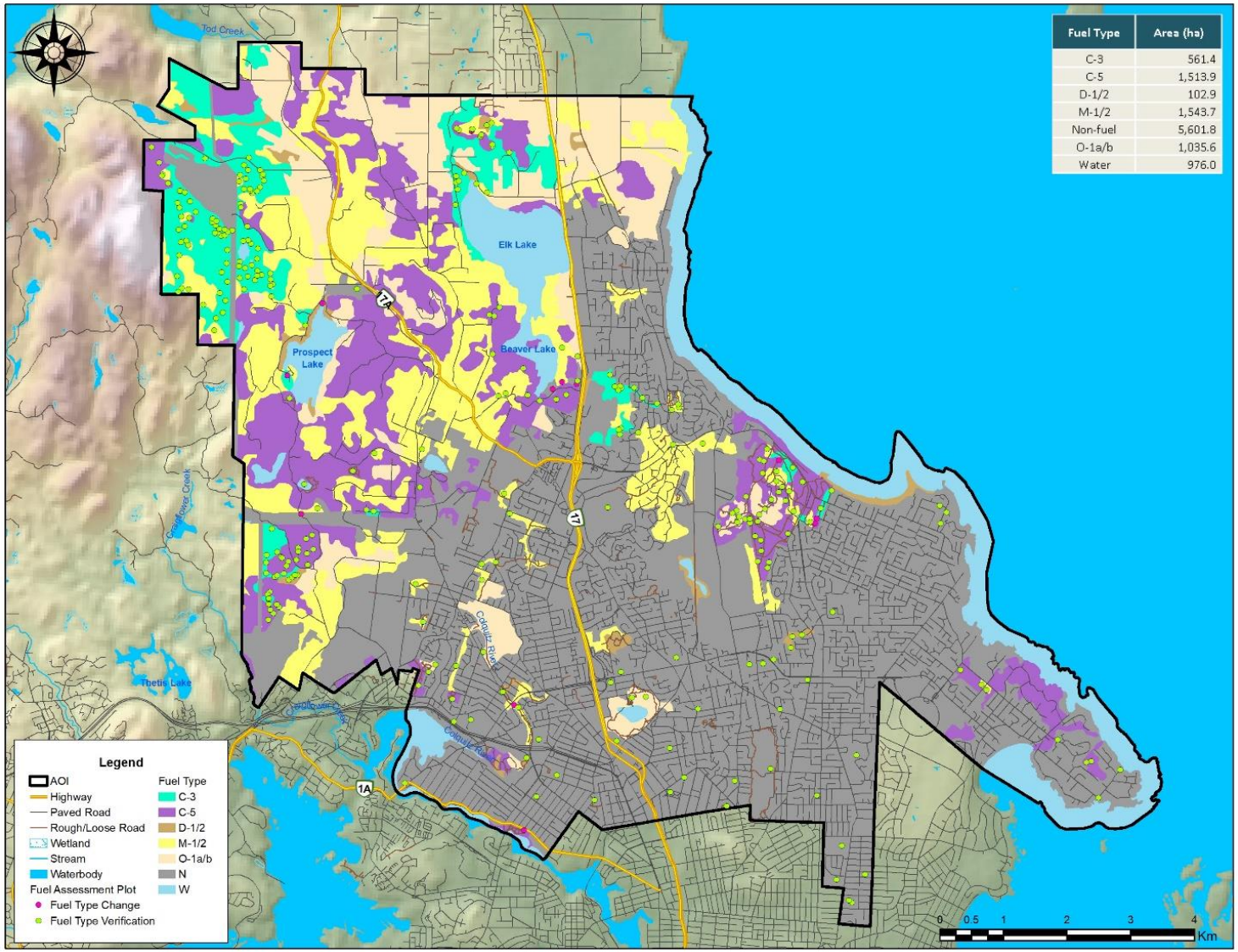
**C-3 fuel type is considered to have a high crown fire and spotting potential within the study area due to the presence of moderate to high fuel loading (dead standing and partially or fully down woody material), and continuous conifer ladder fuels (i.e., western redcedar, Cw, and/or Douglas-fir, Fd).*

During field visits, the following 12 recurring patterns of fuel type errors were found in the provincial dataset:

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

- M-1/2 fuel types identified as C-5,
- M-1/2 fuel types identified as O-1a/b,
- M-1/2 fuel types identified as D-1/2,
- N fuel types identified as D-1/2,
- N fuel types identified as M-1/2, and
- N fuel types identified as O-1a/b.

All fuel type updates were approved by BCWS, using stand and fuel descriptions and photo documentation for the review process (see Appendix B – Wildfire Threat Assessment – FBP Fuel Type Change Rationale 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 18. Proximity to the Interface. describes the classes associated with proximity of fuels to the interface.

Table 18. Proximity to the Interface.

Proximity to the Interface	Descriptor*	Explanation
WUI 100	(0-100 m)	This Zone is always located adjacent to the value at risk. Treatment would modify the wildfire behaviour near or adjacent to the value. Treatment effectiveness would be increased when the value is FireSmart.
WUI 500	(101-500 m)	Treatment would affect wildfire behaviour approaching a value, as well as the wildfire's ability to impact the value with short- to medium- range spotting; should also provide suppression opportunities near a value.
WUI 2000	(501-2000 m)	Treatment would be effective in limiting long-range spotting but short-range spotting may fall short of the value and cause a new ignition that could affect a value.
	>2000 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 (100 m). 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. Wind plays a predominant role in fire behaviour and direction of fire spread and is summarized in the Wind Rose 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/hour and gusting upwards of >30 km/hr. Winds also occur to a lesser degree from the southwest and northeast (Figure

5).[85] 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.

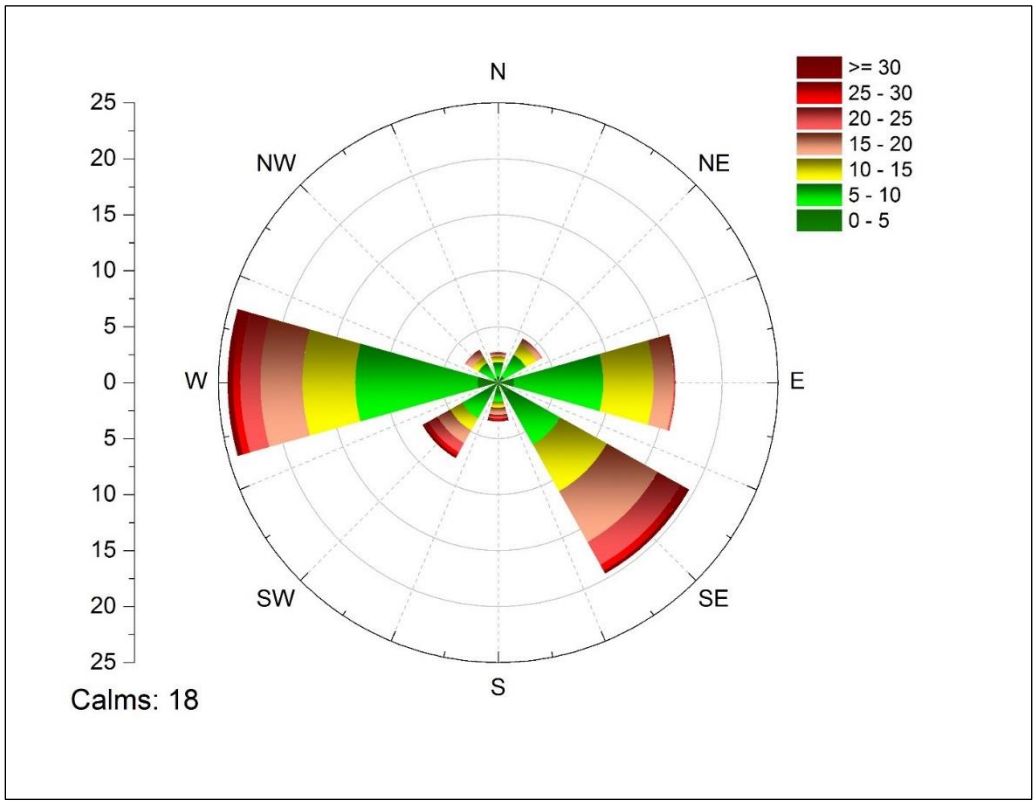


Figure 4. Windrose showing average hourly wind readings during the fire season (April – October). Data taken from the Victoria International Airport weather station.

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.

[85] Government of Canada - Environment and Natural Resources. 2020. Weather Climate and Hazard. Retrieved from: https://climate.weather.gc.ca/climate_data/hourly_data_e.html?hlyRange=1953-01-01%7C2013-07-11&dlyRange=1940-07-01%7C2013-07-10&mlyRange=1940-01-01%7C2013-07-01&StationID=118&Prov=BC&urlExtension=_e.html&searchType=stnName&optLimit=yearRange&StartYear=1840&EndYear=2021&selRowPerPage=25&Line=21&searchMethod=contains&txtStationName=VICTORIA&timeframe=1&time=LST&time=LST&Year=2012&Month=7&Day=10#

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 19 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 20. A value placed at the bottom of the slope is equivalent to a value on flat ground (see Table 19). A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread (Table 20). The majority of the slopes (89%) in the AOI are on less than 20% slope and will likely not experience accelerated rates of spread due to slope class, and approximately 11% percent of the AOI has a slope greater than 20% and is likely to experience an increased or high rate of spread. On the larger topographic scale, the DOS and its commercial, recreational, and residential developments would be considered to be at the bottom of the slope through to mid slope in the higher elevation residential areas.

Table 19. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of AOI	Fire Behaviour Implications
<20%	89.3%	Very little flame and fuel interaction caused by slope, normal rate of spread.
20-30%	7.1%	Flame tilt begins to preheat fuel, increase rate of spread.
30-40%	2.4%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
40-60%	1.1%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	0.1%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

Table 20. 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 5.

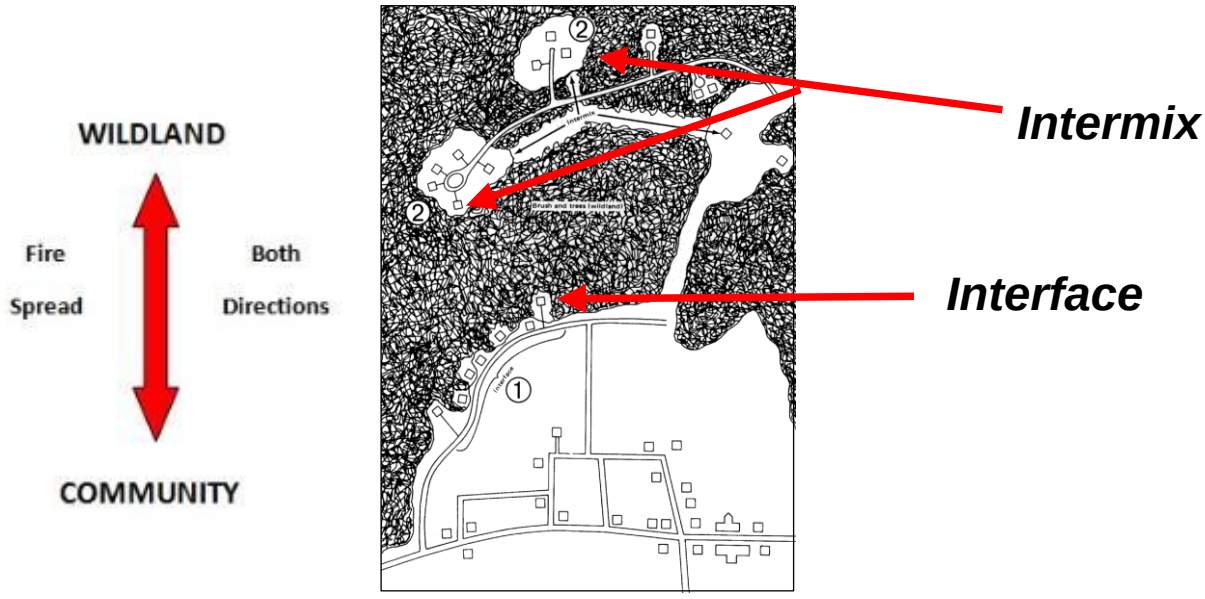


Figure 5. Illustration of intermix and interface situations.

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, cedar hedges, bark mulch, etc.) (Figure 6).
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 7).

Figure 6. Firebrand caused ignitions: burning embers are carried ahead of the fire front and alight on vulnerable building surfaces.

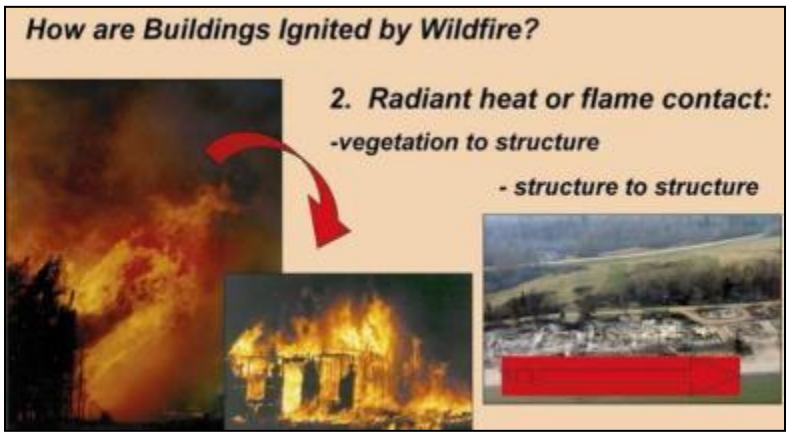


Figure 7. Radiant heat and flame contact allows fire to spread from vegetation to structure or from structure to structure.

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

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

Table 21. Summary of WUI Threat Assessment Worksheets.

Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
BEAR-1	Located in Bear Hill Park, east of Bear Hill Rd	Moderate	n/a
DOUG-1	Located in Mount Douglas Park, east of Blenkinsop Rd	Moderate	n/a
DOUG-2	Located in Mount Douglas Park, east of Cedar Hill Rd	High	High
DOUG-3	Located in Mount Douglas Park, east of Cedar Hill Rd	High	High
ELK-1	Located at the southeastern tip of Elk Lake, west of Elk Lake Dr	Moderate	n/a
ELK-2	Located at the southwestern tip of Elk Lake, north of Glencoe Dr	Moderate	n/a
ELK-3	Located west of Grant Park, south of Bossi Pl and Wesley Crt	High	Extreme
ELK-4	Located within Boulderwood Hill Pk, north of Bearwood Ln	High	High
HARO-1	Located northwest of Goward Park, east of Edgelow St	Moderate	n/a
LAND-1	Located south of the Hartland Landfill	High	Moderate
LAND-2	Located south of the Hartland Landfill	High	Moderate
LAND-3	Located south of the Hartland Landfill	High	Moderate
LAND-4	Located south of the Hartland Landfill	Moderate	n/a
LIMB-1	Located within Kardum Park, west of Ivor Rd	Moderate	n/a
MAPLE-1	Located within McMinn Park, south of Maplegrove St	High	High
MEAD-1	Located within Killarney Lake Park, northwest of Meadowbrook Rd	High	Extreme
MEAD-2	Located within Killarney Lake Park, south of Hartland Ave	High	Extreme
MEAD-3	Located within Killarney Lake Park, northwest of Meadowbrook Rd	High	High

Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
MUNN-1	South of Goy Park, along Prospect Lake Rd	Moderate	n/a
MUNN-2	Located south of Munn Rd	High	Moderate
MUNN-3	Located west of Woodsend Dr	Moderate	n/a
MUNN-4	Located west of Woodsend Dr	Moderate	n/a
MUNN-5	Located southwest of Munn Rd and Prospect Lake Rd intersection	High	Moderate
MUNN-6	Located north of Munn Rd	Moderate	n/a
PROSP-1	Located within South Prospect Lake Park	High	Extreme
SEA-1	Located within Konukson Park north of Sea point Dr	Moderate	n/a
WILL-1	Located east of the Hartland landfill, south of Willis Point Rd	High	Extreme
WILL-2	Located east of the Hartland landfill, south of Willis Point Rd	High	Moderate

*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 2018 provincial fuel typing layer provided by BCWS as part of the *2018 Provincial Strategic Threat Analysis* (PSTA) data package. This fuel type layer is based on the FBP fuel typing system. PSTA data is limited by the accuracy and availability of information within the Vegetation Resource Inventory (VRI) provincial data; confidence in provincial fuel type data is very low on private land. The PSTA threat class for all private land within the AOI was not available. Fuel types within the AOI have been updated using ortho imagery 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.[86]

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

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

1. Update fuel-typing using orthophotography provided by the client and field verification.
2. Update structural data using critical infrastructure information provided by the client, field visits to confirm structure additions or deletions, and orthophotography
3. Complete field work to ground-truth fuel typing and threat ratings (completed 28 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 600+ 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 22 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 22. 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	

WUI Threat Sheet Attribute	Used in Analysis?	Comment
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 200 m are rated as 'extreme', within 500 m are rated as 'high', within 2 km are 'moderate', and distances over that are rated 'low'.

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

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

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

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

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

Limitations

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

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