Community Wildfire Protection Plan

Regional District of Okanagan-Similkameen

CWPP Update – June 2020

Frontline Operations Group

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Regional District of Okanagan-Similkameen

Community Wildfire Protection Plan – Update

July 6, 2020

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"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."

Supervision certification statement

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Acknowledgements

Frontline acknowledges that our work on this project was carried out on the traditional and unceded territory of the distinct and sovereign Syilx/Okanagan Nation. Over the course of this project we were afforded the opportunity to experience the diversity and beauty of Syilx Territory, and we reaffirm our support of the inherent jurisdiction of Syilx/Okanagan Nation to manage the land and resources within it.

We offer our sincere thanks to Doug Reeve and Dave Bodak from the RDOS for their support and guidance through the course of this project. We are especially grateful for their patience and understanding as we completed the project during a difficult time for everyone during the corona virus pandemic.

Finally, we wish to thank the representatives who attended the consultation sessions held in the early stages of the project. They are:

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- Rob Osiowy, BC Wildfire Service
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Executive Summary

The Regional District of Okanagan-Similkameen (RDOS) has long had a relationship with environmental disturbance, including wildland fire. The past three fire seasons alone have seen several wildfires that have affected residents through evacuation alerts and orders, including the Finlay Creek (2017), Mount Eneas (2018) and Eagle Bluff (2019) fires. In addition, climate change, coupled with the effects of a history of fire exclusion continue to compound the wildfire problem faced in British Columbia. To reframe the wildfire issues faced by the community, and to position the regional district to access future prevention funding under the Community Resiliency Investment (CRI) program, the RDOS retained Frontline Operations Group Ltd. to undertake an update to its Community Wildfire Protection Plan (CWPP), which was first completed in 2011.

Community Wildfire Protection Plans have been a foundational element of the former Strategic Wildfire Prevention Initiative (SWPI), and now the CRI program, and serves to paint the complete wildfire picture for communities in British Columbia. Within the context of the CRI program, a CWPP serves as the starting point for wildfire prevention and threat mitigation efforts for local government. These efforts are primarily centered around a combination of public engagement and education, and fuels management. The FireSmart program is an example of an effective education and engagement strategy to reduce the wildfire threat to residences and property and is an area in which the RDOS has been active in promoting for some time. FireSmart is a key aspect of prevention and mitigation, as it attempts to generate and sustain grassroots participation in reducing the susceptibility of private property and homes to wildfire. Fuels management is a strategy undertaken at a larger scale by landowners and seeks to modify or reduce wildland fuel characteristics or abundance in order to reduce potential wildfire intensity and threat to adjacent values. Fuels management to mitigate wildfire threats to communities is a shared responsibility amongst local governments, First Nations, and the provincial government. For regional districts such as the RDOS, the vast majority of wildland fuels are situated on Crown land, and this is reflected in the threat assessments completed for the CWPP.

As a partial indicator of potential future wildfire activity, a fire history analysis has been completed for the CWPP. The occurrence rate of wildfires within the RDOS area of interest (AOI) indicates a relatively stable rate of person-caused wildfires across most Electoral Areas.

Lightning fire occurrence displays a relatively similar flat occurrence rate, though a number of Electoral Areas exhibit a slight increase, which may be attributable to improved wildfire detection over the course of the dataset. In nearly all Electoral Areas, the annual area burned has increased in the past five years compared to previous decades. Furthermore, an analysis of eight BC Wildfire Service fire weather stations in the region demonstrate a marked increase in the number of Fire Danger Class 4 and 5 days occurring each year.

Geospatial analysis of provincial fuel type layers and the provincial strategic threat analysis (PSTA) outputs further characterize the wildfire risks that the RDOS continues to face. Although parts of RDOS are relatively well-protected by orchards or agricultural fields, other areas dominated by grasslands and timber remain vulnerable, and continued emphasis needs to be placed on the responsibilities of private property owners to manage their fuel hazards. This includes residential property owners and the steps they can take to manage their landscaping and structure characteristics to make their homes less prone to ignition during a wildfire.

Wildland urban interface wildfire threat assessments were completed on Crown and regional district land where geospatial analysis and fire behaviour modelling was classified as moderate or higher. Based on the threat assessments, 44 areas have been recommended for wildfire risk reduction treatment, totalling 2,927 ha – the majority of which are on Crown land

The RDOS will continue to face wildfire pressures, and these should be expected to increase in a changing climate. By maintaining a proactive focus on wildfire prevention and mitigation efforts, and through continued advocacy at the local and provincial levels, the community can continue to find ways to grow and thrive in an active wildfire environment.

Summary of CWPP Recommendations

	Objective/Priority	Recommendation/ Next Steps	Responsibility/Funding Source
Section 1.2: CWPP Planning Process	Establish an annual review cycle to assess and report CWPP recommendation progress.	Establish an annual review and reporting schedule that includes: • Progress related to CWPP recommendations • Identification of impediments to progress • Identification of opportunities for improvement • Development of a periodic (e.g. every 3 – 5 years) survey or other public engagement in order to obtain ongoing public opinion and perceptions. • Preparation for next year's activities and any related funding applications	RDOS with UBCM funding support
	Establish a major review cycle (4-6 years) to assess plan relevance and usefulness.	Establish a 4-6 major review cycle that includes: • Comparison of the current RDOS CWPP with the current UBCM/BCWS CWPP (or similar) template and format • High-level assessment of wildfire environmental factors (forest health, fuel conditions, climate change) • High-level assessment of statutory and policy changes related to the current CWPP	RDOS with UBCM funding support
Section 4: Wildfire Threat	Improved fire weather information	• The RDOS would benefit from BCWS re-establishing the Chain Lake and Stemwinder fire weather stations. Benefits would include: o Improved fire weather information by	BCWS

		reducing the blind spots that exist at Chain Lake and Stemwinder • Initiate discussions with BCWS to investigate the willingness and feasibility of re-establishing the Chain Lake and Stemwinder fire weather stations.	
Section 5: Risk Management and Mitigation Factors	Establish a Wildfire Development Permit Area	• Establish a Wildfire Development Permit Area for the entire RDOS. As various Official Community Plans (OCPs) are amended or updated from time to time, ensure that requirements and guidelines complement the Wildfire Development Permit Area requirements. • Progress to date: RFP concluded in May 2020 seeking proposals to update the OCP and develop a Wildfire DPA for Electoral Area A.	RDOS with UBCM funding support
Section 5: Risk Management and Mitigation Factors	Conduct fuel hazard mitigation – regional district lands	• Over a 3-5 year period, apply for funding to prescribe and treat 32.4 ha of municipal ownership class lands summarized in Table 13.	RDOS with UBCM CRI funding support
Section 5: Risk Management and Mitigation Factors	Support fuel hazard mitigation – crown lands	• Through the South Okanagan Similkameen Wildfire Prevention Working Group, support FLNRORD to develop prescriptions and undertake wildfire risk reduction treatments on 2,874 ha of crown land summarized in Table 13 that pose a hazard to residential property in RDOS.	FLNRORD with funding from the Crown Land Wildfire Risk Reduction (CLWRR) program

Section 5: Risk Management and Mitigation Factors	Support fuel hazard mitigation – BC Parks	• Through the South Okanagan Similkameen Wildfire Prevention Working Group, support BC Parks to develop prescriptions and undertake wildfire risk reduction treatments on 20.5 ha of provincial park/protected area summarized in Table 13 that pose a hazard to residential property in RDOS.	BC Parks
Section 5: Risk Management and Mitigation Factors	Ensure that the current CWPP and related deliverables are readily accessible and shared with the public, First Nations, adjacent local governments, industry, and relevant NGOs.	• Post the CWPP and maps on the RDOS website and share across social media platforms • Share the CWPP and maps with partners and stakeholders. • Present and make available the CWPP and maps during public FireSmart meetings and presentations.	RDOS; South Okanagan Similkameen Wildfire Prevention Working Group
Section 5: Risk Management and Mitigation Factors	Develop a regional district wildfire risk reduction communications plan	• In support of the goals of the South Okanagan Similkameen Wildfire Prevention Working Group, develop an RDOS communications for wildfire risk reduction engagement with partners, stakeholders, and the public. The plan should include: o The ecological and cultural roles that fire has had on the regional landscape o The critical role that private landowners can play in the shared responsibility of wildfire risk reduction o The requirement for current	RDOS with UBCM CRI funding support. Coordination with the South Okanagan Similkameen Wildfire Prevention Working Group.

		information and guidance from official sources, with the understanding that links to some sites invariably change periodically o The requirement for current Fire Danger Class information for each of the BCWS fire weather stations that are representative to the RDOS.	
Section 5: Risk Management and Mitigation Factors	Conduct FireSmart Community Recognition Projects	• Continue to support new FireSmart Community Recognition projects for RDOS neighbourhoods. A prioritized list of recommended areas can be found in Table 15 o Over a five-year period, plan on completing two (at minimum) community recognition projects per year • While recognizing that FireSmart Community Recognition projects are not intended to be one-time efforts, provide annual support to the existing FireSmart Boards in the RDOS and support the annual application for renewal of recognition • Substantial progress has been made, with the completion of FireSmart Community Assessment Reports for: o Faulder o Twin Lakes o Kaleden o Husula o Heritage Hills	RDOS with UBCM CRI funding support

		○ Smethhurst /Arawana ○ Missezula Lake ○ St. Andrews	
Section 5: Risk Management and Mitigation Factors	Acquire an enclosed trailer that can be branded with RDOS FireSmart graphics and stocked with public education materials, as well as hand tools and basic PPE (e.g. gloves and eye protection) to facilitate FireSmart events, including neighbourhood brush cleanup. Trailer should be paired with a rental chipper and/or disposal bins to facilitate debris disposal (with qualified operator).	• Establish trailer design requirements (should be enclosed and locking), including interior modification to enable the secure storage and transportation of public education and basic hand tools. • Determine the RDOS and FireSmart branding requirements and secure permission from FireSmart Canada for the use of their brand. • Purchase trailer, presentation materials, hand tools. • Establish a list of qualified vendors to supply a chipper with operator and/or disposal bin. Vendor sponsorship may help to off-set capital acquisition and operating costs.	RDOS with UBCM funding support. Vendor/supplier sponsorship may help to off-set costs.
Section 5: Risk Management and Mitigation Factors	Support fire use and prescribed fire in the region.	• By way of the South Okanagan Similkameen Wildfire Prevention Working Group, support those agencies and First Nations that are managing natural fire use and prescribed fire by: ○ Amplifying public engagement that supports prescribed fire use	RDOS; South Okanagan Similkameen Wildfire Prevention Working Group.
Section 5: Risk Management and Mitigation Factors	Establish a working relationship between RDOS and MoTI to address wildland fuel hazard concerns along Provincial highways in the RDOS.	• Develop a memorandum of understanding (or similar) to facilitate the ongoing and shared interest in wildland fuel management and roadside vegetation control, including:	RDOS; South Okanagan Similkameen Wildfire Prevention Working Group; MoTI.

		○ A shared interest in identifying, monitoring and mitigating roadside wildland fuel hazards • Establishment of best practices related to roadside vegetation control in RDOS that attempts to limit the occurrence of hazardous wildland fuel during the fire season.	
Section 6: Wildfire Response	Undertake evacuation route planning that includes the identification of single access/egress routes to populated areas in relation to wildfire threat.	• Identify all single access/egress routes to populated areas, and areas of potential congestion (i.e. bottlenecks, pinch points etc.) in proximity to Moderate to Extreme potential fire behaviour • Develop strategies, tactics and trigger points that facilitate safe evacuation or shelter-in-place for the public	RDOS with UBCM funding support. RDOS is currently undertaking an evacuation planning project.
Section 6: Wildfire Response	Pursue enhanced cross-training with BCWS	• Open dialogues with the appropriate BCWS Fire Zone Wildfire Officer to determine the feasibility of: ○ Initiating enhanced cross-training opportunities to facilitate multi-agency coordination and safety, including enhanced airtanker use and safety training.	RDOS and BCWS with UBCM funding support
Section 6: Wildfire Response	Increase the SPU capabilities within the RDOS to include 2-3 strategically located Type 2 SPUs	• Determine most appropriate home departments, taking into account: ○ Storage capacity ○ Interest ○ Regional distribution	RDOS with funding support from Office of the Fire Commissioner (OFC)

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1 Introduction

The Community Wildfire Protection Plan (CWPP) program was initiated by the Province of British Columbia as a response to key recommendations contained in the Firestorm 2003 Provincial Review (Filmon, Leitch and Sproul 2004). The CWPP program is administered by the Union of BC Municipalities (UBCM) as a foundational component of the Community Resiliency Investment (CRI) program- a new provincial program[1] intended to reduce the risk of wildfire to communities in BC through community funding, supports and priority fuel management activities in the wildland urban interface (Union of BC Municipalities 2019). The CWPP program is available to all local governments and First Nations in BC. The Regional District of Okanagan-Similkameen (RDOS) was successful in applying for a CRI grant to undertake an update to the original 2011 CWPP completed under the SWPI program.

1.1 Purpose

A CWPP identifies wildfire risks to a community, describes the potential impact that wildfire may have on the community, and details recommendations to reduce risk and increase the community's resilience to wildfire threats.

The overarching goal of the CWPP is to define the threat to human life, property and critical infrastructure from wildfires in a given area, identify measures necessary to mitigate those threats and outline a plan of action to implement the measures.

The intended outcome of the CWPP planning process is to provide the community with a detailed framework for further efforts that will:

- reduce the likelihood of a wildfire entering into communities;
- reduce the impacts and/or losses to property and critical infrastructure; and
- reduce negative economic and social wildfire impacts to communities.

1.2 CWPP Planning Process

Upon successful application for funding, the RDOS selected Frontline Operations Group Ltd. to update the 2011 CWPP. Andrew Low, RPF, and John Davies, RPF, supervised the field

[1] Prior to CRI, Community Wildfire Protection Plans were administered under the Strategic Wildfire Prevention Initiative (SWPI) of the UBCM.

assessments, analysis and report compilation as forest professionals qualified in all aspects of the practice of wildland fire management. All consultations with RDOS were through the Project Coordinator, Doug Reeve. In addition, two consultation sessions were held with response and preparedness partners early in the planning process.

Going forward, the RDOS should view the CWPP planning process as a continuing cycle as opposed to a periodic process, whereby progress is assessed and reported annually. Doing so will help to ensure an ongoing awareness of changing or developing wildfire issues that might necessitate a plan amendment or strategic shift in the way that the RDOS approaches wildfire management concerns. At minimum, the CWPP should be evaluated every 4-6 years to determine whether the plan remains relevant or whether an update is warranted. In all likelihood, the issue of CWPP plan updating will be in part determined by UBCM/BCWS policy as it evolves.

1.3 Summary of Recommendations

Recommendation	Responsibility/Funding Source	Next Steps
Establish an annual review cycle to assess and report CWPP recommendation progress. Periodically (e.g. every 3-5 years) the review should include a public engagement element, such as a survey or open-house event that affords the public the opportunity to participate.	RDOS with UBCM funding support	Establish an annual review and reporting schedule that includes: • Progress related to CWPP recommendations • Identification of impediments to progress • Identification of opportunities for improvement • Development of a periodic (e.g. every 3 – 5 years_ survey or other public engagement in order to obtain ongoing public opinion and perceptions. • Preparation for next year's activities and any related funding applications

Establish a major review cycle (4-6 years) to assess plan relevance and usefulness.	RDOS with UBCM funding support	Establish a 4-6 major review cycle that includes: • Comparison of the current RDOS CWPP with the current UBCM/BCWS CWPP (or similar) template and format • High-level assessment of wildfire environmental factors (forest health, fuel conditions, climate change) • High-level assessment of statutory and policy changes related to the current CWPP

2 Local Area Description

The RDOS is one of 27 regional districts in the province of British Columbia and is home to a population of 83,022 (Statistics Canada 2017). The RDOS is organized into nine Electoral Areas, designated A through I and shares the area with the following Indian Bands and municipalities:

- Penticton Indian Band
- Osoyoos Indian Band
- Lower Similkameen Indian Band
- Upper Similkameen Indian Band
- The Corporation of the City of Penticton,
- The Corporation of the District of Summerland,
- Town of Oliver,
- Town of Osoyoos,
- Town of Princeton, and
- Village of Keremeos.

2.1 CWPP Area of Interest

The area of interest (AOI), as used in CWPP terminology, essentially describes the study area. The UBCM guidance for defining the AOI is rather flexible, ranging from simply the extent of wildland urban interface (WUI) as the minimum, to taking a wider view consisting of the local government's legal boundary. The WUI is any area where combustible wildland fuels (vegetation) are found adjacent to homes, farm structures, other outbuildings, or infrastructure. This may occur in the interface, where development and wildland fuels meet along a well-defined edge, or the intermix, where development and wildland fuels intermingle amongst each other (Partners in Protection 2003). For this CWPP update the AOI is the entirety of the RDOS (Figure 1).

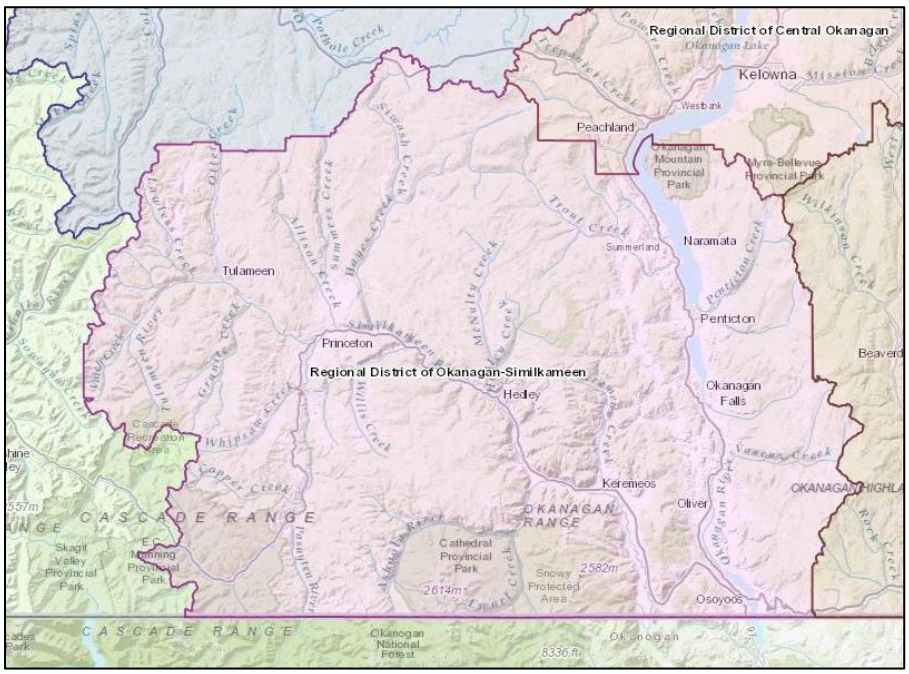

Figure 1 The Regional District of Okanagan-Similkameen

2.2 Community Description

The RDOS is an ecologically diverse area of the Southern Interior, ranging from moist sub-maritime forests in the furthest western reaches of the regional district to hot dry open grasslands occupying southern areas and lower elevation valley bottoms. Natural disturbance patterns (most notably fire) in the RDOS reflect this diversity, ranging from frequent stand maintaining to infrequent stand initiating processes. Economically, the diverse ecology of the RDOS translates into opportunities in tourism, forestry and agriculture and ranching.

The RDOS is governed by a board consisting of two types of directors: Electoral Area Directors, elected directly by rural voters serving four-year terms, and Municipal Directors, elected first to municipal council and then appointed by their council to the regional district board for a one-year term. Currently the District is comprised of nineteen Directors; ten Municipal Directors representing the City of Penticton, District of Summerland, Town Osoyoos, Town of Oliver, Town of Princeton and Village of Keremeos, and nine Electoral Area Directors representing Osoyoos Rural, Cawston, Oliver Rural, Skaha East/Okanagan Falls, Naramata, Okanagan Lake West/West Bench, Keremeos Rural/Hedley, Rural Princeton and Skaha West/Kaleden/Apex. The proportion of land ownership types is variable across the nine Electoral Areas, as presented in Table 1.

Table 1 Proportion of ownership types in the RDOS.

	Area A		Area B		Area C		Area D		Area E		Area F		Area G		Area H		Area I		RDOS (all)	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Crown	7,991	26%	16,118	59%	22,856	42%	30,260	51%	19,971	37%	46,985	70%	190,159	88%	428,386	90%	23,754	50%	786,481	76%
Federal	27	0%	0	0%	220	0%	630	1%	0	0%	86	0%	1	0%	29	0%	1,404	3%	2,395	0%
First Nation	3,402	11%	3,763	14%	9,764	18%	0	0%	0	0%	8,977	13%	12,802	6%	323	0%	10,914	23%	49,944	5%
Mixed Ownership	36	0%	1	0%	68	0%	0	0%	0	0%	0	0%	0	0%	14	0%	199	0%	317	0%
Municipal	13	0%	5	0%	134	0%	541	1%	231	0%	15	0%	32	0%	274	0%	46	0%	1,291	0%
None	9,307	30%	2,433	9%	12,488	23%	23,085	39%	31,267	58%	6,170	9%	5,647	3%	23,028	5%	3,005	6%	116,428	11%
Private	8,503	28%	5,063	18%	8,699	16%	4,639	8%	2,738	5%	5,045	7%	7,087	3%	25,807	5%	8,198	17%	75,781	7%
Unknown	1,275	4%	0	0%	23	0%	88	0%	31	0%	81	0%	26	0%	592	0%	150	0%	2,266	0%
	30,553	100%	27,383	100%	54,252	100%	59,242	100%	54,239	100%	67,359	100%	215,753	100%	478,452	100%	47,669	100%	1,034,903	100%

2.3 Past Wildfires, Evacuations and Impacts

Wildfires have been a regular and natural disturbance agent in the Okanagan-Similkameen for millennia. In recent years, the RDOS has felt the effects of several wildfires, ranging from small fast-moving fires that are contained relatively quickly, to prolonged periods of large fires burning in the surrounding area. Most recently the Province of British Columbia, and concurrently the RDOS, was subjected to back-to-back record-breaking fire seasons in 2017 and 2018. In both years numerous wildfires threatened various communities leading to mass evacuation alerts and orders.

The Okanagan-Similkameen has had its share of wildfires in the WUI, prompting both evacuation orders and alerts – the most recent being the Eagle Bluff fire northeast of Oliver, BC in 2019. Fortunately, since 2003, which saw the loss of 238 homes in the neighbouring Regional District of Central Okanagan, the RDOS has been spared from the more wide-spread and catastrophic destruction of homes and whole neighbourhoods, as has been the case in other parts of western Canada. This could be partly attributed to public education and efforts to

FireSmart local neighborhoods, but there is likely an element of luck as well. A detailed fire history analysis, including fire occurrence and annual area burned within the AOI is provided in Section 4. The more significant wildfires in the RDOS from the past decade are summarized in Table 2.

Table 2 Recent fires of significance to the RDOS.

Year	Geographic	Size (ha)	Notes
2019	Eagle Bluff	2,639	Evacuation alerts
2018	Mount Conkle	118.5	Evacuation alerts
2018	Mount Eneas	1,790	Evacuation alerts and orders
2018	Cool Creek	13,626	Evacuation alerts and orders
2018	Snowy Mountain	19,226	Evacuation alerts and orders
2018	Placer Mountain	2,372	Evacuation alerts and orders
2018	Old Tom Creek	1,380	
2017	Diamond Creek	12,453	Crossed from USA into BC
2017	Finlay Creek	2,224	Evacuation alerts and orders
2015	Sidley Mountain	50	Crossed from USA into BC; evacuation alerts and orders
2015	Wilsons Mountain	317	Evacuation alerts and orders
2015	Testalinden Creek	133	Evacuation alerts and orders
2014	Boot Hill	101	
2014	Apex Mountain	245	Evacuation alert
2010	Tweddle Creek	650	
2003	Okanagan Mountain Park	26,000	Evacuation alert and orders, 238 homes destroyed

2.4 Current Community Engagement

Since 2004, as a result of the Firestorm 2003 review, the RDOS has made efforts to raise WUI fire safety awareness and advocate for mitigation. This included the creation of the 2011 CWPP, which led to various fuel management treatments and FireSmart projects. Completed FireSmart projects to date include:

- Faulder, 2017
- Husula Highlands, 2017
- Kaleden & St. Andrews, 2018
- Missezula Lake, 2018
- Twin Lakes, 2018
- Heritage Hills/Lakeshore Highlands, 2019
- Naramata (Smethurst/Arawana), 2019

2.5 Linkages to Other Plans and Policies

Several plans and policies exist at the local and provincial levels of government that pertain to the response and recovery of WUI fires, as well as wildfire management in general. The

following is a broad survey of the various plans and policies that influence wildfire management.

2.5.1 Local Authority Emergency Plan

The RDOS maintains a region-wide emergency plan as required under the Provincial Emergency Program Act (EPA) The Emergency Response and Recovery Plan (ERRP) was developed in 2010 as a comprehensive all-hazard plan that can be implemented for all foreseeable emergencies within the regional district (Regional District of Okanagan-Similkameen 2010). The ERRP outlines all functions and capabilities of the RDOS Emergency Management Program, as well as:

- Emergency management organization (BCEMS);
- Roles and Responsibilities;
- Stakeholders;
- Emergency notification procedures;
- Hazard, Risk and Vulnerability Analysis (HRVA)
- Emergency response implementation procedures;
- Directory of vital services and resources;
- Emergency Operations Centre (EOC) procedures;
- Communications procedures;
- Public information guidelines;
- Evacuation guidelines;
- Resource management (material and human).

A detailed, hazard-specific plan for responding to WUI fires can be found in 'Annex G' of the ERRP on page 162. Additionally, an HRVA matrix can be found on page 10 (and in Figure 2) illustrating the higher likelihood and severity of WUI fires within the RDOS compared to other hazards.

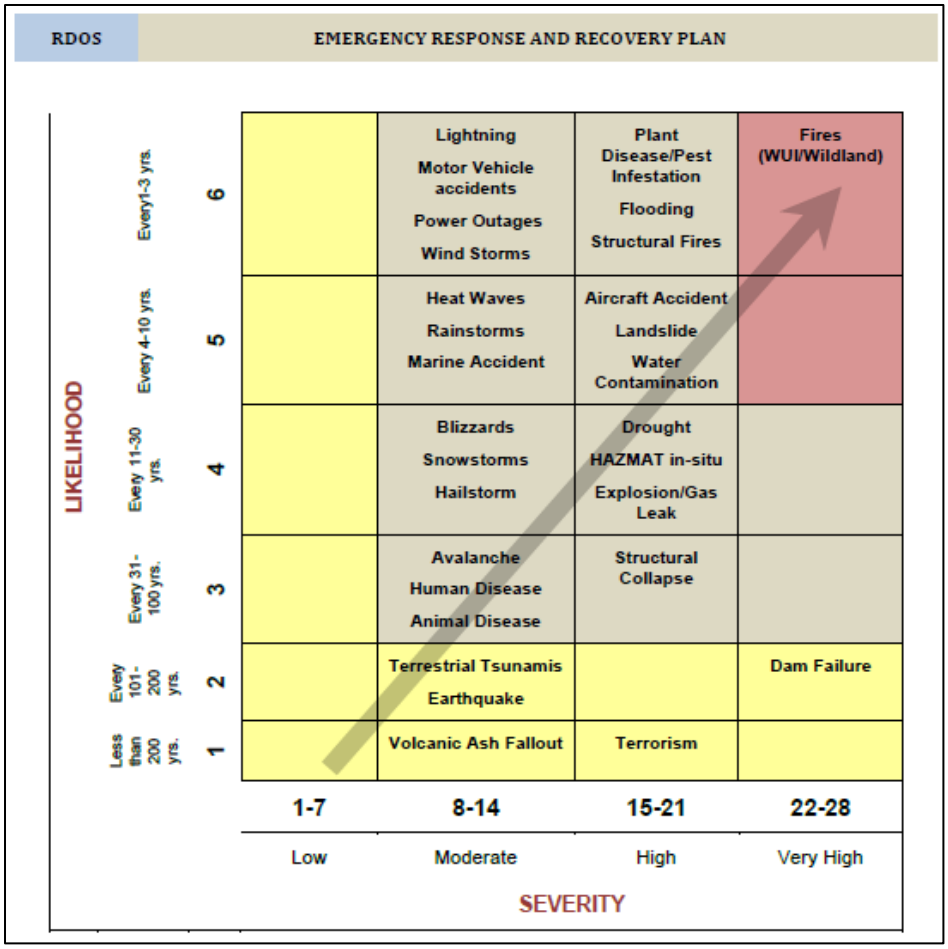

Figure 2 Hazard, Risk and Vulnerability Analysis (HRVA) for the RDOS, as contained in the RDOS Emergency Response and Recovery Plan.

The RDOS Emergency Management Program is an integrated program that includes all unincorporated communities within the regional district as well as the incorporated communities of the Town of Princeton, Village of Keremeos, Town of Osoyoos, Town of Oliver, City of Penticton and the District of Summerland through Bylaw No. 2375 (Regional District of Okanagan-Similkameen 2006). This integrated approach was designed to maximize available resources, limit duplications and streamline communication.

2.5.2 Affiliated CWPPs

Neighbouring jurisdictions with existing CWPPs include:

- Penticton Indian Band (2009, updated 2017)
- Lower Similkameen Indian Band (2010)
- Upper Similkameen Indian Band (2010)
- Osoyoos Indian Band (2010)
- District of Summerland (2005, update in progress)

- District of Peachland (2004, 2011, update in progress)
- City of Penticton (2005, 2015)
- Village of Keremeos (2017)

2.5.3 Local Government Plans and Policies

The following Official Community Plans (OCPs) with wildfire-specific policies and pertinent bylaws are in effect within the AOI:

- Electoral Area "A" – Osoyoos Rural
    - Osoyoos Rural Official Community Plan Bylaw No. 2450, 2008
        - Update completion planned for 2021
    - Encourage the considerations of wildfire hazard and risk given for approving proposals for small/large holdings, residential, and commercial development
    - Section 14.3 Policies; The Regional Board:
        - Will direct development away from those lands that may have a potential natural hazard, or which have been identified as hazardous by the RDOS or other agencies having jurisdiction
        - May request that the Regional Subdivision Approving Authority require the developer to undertake a fire hazard risk assessment at the time of submitting a subdivision application where the province indicated that a property may be subject to a moderate or higher fire risk. The Regional Board may require the same assessment during the rezoning or development permit process. The assessment will provide a recommended mitigation strategy that will be submitted to both the Regional District and the Province.
- Electoral Area "C" – Oliver Rural
    - Oliver Rural Official Community Plan Bylaw No. 2452, 2008
        - Includes all amendments up to December 5, 2019
    - Encourage the considerations of wildfire hazard and risk given for approving proposals for small/large holdings, residential, and commercial development
    - Section 17.3 Policies; The Regional Board:
        - Will direct development away from those lands that may have a potential natural hazard, or which have been identified as hazardous by the RDOS or other agencies having jurisdiction

        - May request that the Regional Subdivision Approving Authority require the developer to undertake a fire hazard risk assessment at the time of submitting a subdivision application where the province indicated that a property may be subject to a moderate or higher fire risk. The Regional Board may require the same assessment during the rezoning or development permit process. The assessment will provide a recommended mitigation strategy that will be submitted to both the Regional District and the Province.

- Electoral Area "D" – East Skaha, Vaseux
    - East Skaha, Vaseux Official Community Plan Bylaw No. 2603, 2013
        - Includes all amendments up to December 5, 2019
    - Encourage the considerations of wildfire hazard and risk given for approving proposals for small/large holdings, residential, and commercial development
    - Section 18.3 Policies - Fire Management
        - Minimize fire risk to people and property within the Plan Area by fostering awareness, encouraging new developments designed with wildfire mitigation techniques, review and updating wildfire protection plans and reduction of fuel loading
        - Rezoning application may require an overall assessment of the site for the susceptibility to wildfire from conditions both on and off site, prepared by an RPF licensed in BC, with experience in wildfire risk management and interface fuel hazard assessments
        - Subdivision application may require a detailed report of the site for the susceptibility to wildfire from conditions both on and off-site and ways to reduce that hazard. Report prepared by an RPF licensed in BC, with experience in wildfire risk management and interface fuel hazard assessments. Completion of works that reduce the hazard will be required prior to subdivision approval depending upon the content
        - Rezoning or subdivision application may require a Wildfire Risk Management Plan for the site if the property is within 100m of a forested or grassland ecosystem. Further detailed information may be required as a result of the assessment. Completion of the recommended works in the

Wildfire Risk Management Plan will be required prior to application approval.

- Electoral Area "E" – Naramata
    - Naramata Official Community Plan Bylaw No. 2458, 2008
        - Includes all amendments up to December 5, 2019
    - Considerations of wildfire hazard and risk given to approving proposals for small/large holdings, residential, and commercial development
    - Section 19.4 Fire Management
        - Minimize fire risk to people and property within the Plan Area by fostering awareness, encouraging new developments designed with wildfire mitigation techniques, review and updating wildfire protection plans and reduction of fuel loading
- Electoral Area "F" Okanagan Lake West/West Bench
    - Okanagan Lake West/West Bench Official Community Plan Bylaw No. 2790, 2018
        - Includes all amendments up to December 5, 2019
    - Section 1.4 Development Approval Information
        - The RDOS may require development approval information for a Zoning Bylaw amendment application, Development Permit application or Temporary Use Permit application.
        - Applicant may be expected to provide information regarding fire hazard risk assessment in accordance with the CWPP
    - Section 17.4 Fire Management
        - Minimize fire risk to people and property within the Plan Area by fostering awareness, encouraging new developments designed with wildfire mitigation techniques, review and updating wildfire protection plans and reduction of fuel loading
- Electoral Area "G" Rural Keremeos
    - Zoning Bylaw No. 2781, 2017
        - No reference to wildfire planning.
- Electoral Area "H" Rural Princeton
    - Official Community Plan Bylaw No. 2497, 2012

        - Includes all amendments up to December 5, 2019
    - Section 18.4 Fire Management Policies
        - Subdivision application referred to the RDOS by the Regional Subdivision Approving Authority for development in areas identified in the CWPP and shown on Schedule "E" may require a fire hazard risk assessment from the applicant
        - Rezoning application submitted to the RDOS in areas identified in the CWPP and shown on Schedule "E" may require a fire hazard risk assessment from the applicant and provide a recommended fire hazard mitigation strategy
        - Encourages the Regional Subdivision Approving Authority to require that where a fire hazard mitigation strategy has been prepared the developer enter into a restrictive covenant to ensure the strategy is followed.
        - Encourages the use and practice of wildfire mitigation programs (i.e. FireSmart)
    - Mid-term plan to investigate the implementation of a Development Permit Area related to Wildfire Hazard
- Electoral Area "I" Kaleden-Apex
    - Kaleden-Apex Official Community Plan Bylaw No. 2683, 2016
        - Includes all amendments up to December 5, 2019
    - Section 2.4 Development Approval Information
        - The RDOS may require development approval information for a Zoning Bylaw amendment application, Development Permit application or Temporary Use Permit application.
        - Applicant may be expected to provide information regarding fire hazard risk assessment in accordance with the CWPP
    - Section 17.4 Fire Management
        - Minimize fire risk to people and property within the Plan Area by fostering awareness, encouraging new developments designed with wildfire mitigation techniques, review and updating wildfire protection plans and reduction of fuel loading

- District of Summerland
    - Official Community Plan Bylaw No. 2014-002, 2018
    - Section 25.0 Wildfire Hazard Development Permit Area #1
        - Area includes "all lands identified in Schedule N-1 as Area #1 are part of Development Permit Wildfire Hazards Area #1"
        - Guidelines include neighbourhood and site design, fuel load management, and building materials and construction
        - Summerland's Fire Chief or their designate shall be the approving authority in terms of the Development Permit Guidelines
- City of Penticton
    - Official Community Plan 2045 Bylaw No. 2019-08
    - Section 4.4.1 Resilience to Natural Hazards
        - Protect neighbourhoods and agricultural areas in WUI areas through best management practices and programs such as FireSmart and following recommendations made through Penticton CWPP
    - Section 5.4.2 Hillside Development Permit Area
        - Minimize and mitigate hazards from steep slopes, wildfire and flooding
        - Integrate assessment of wildfire behaviour in hillside development planning and integrate ecologically appropriate FireSmart principles at the neighbourhood-wide and site levels
- Town of Oliver
    - Official Community Plan Bylaw No. 1370
    - Section 1.4 Development Approval Information
        - The Town of Oliver may require development approval information for a Zoning Bylaw amendment application, Development Permit application or Temporary Use Permit application.
        - Consideration of hazard area impacts, including steep slopes, flood prone areas and wildfire interfaces areas.
    - Section 16 Hazard Lands
        - Identifies wildfire risk and supports awareness programs (i.e. FireSmart), updating protection approaches, and seeking funding for wildfire risk reduction in WUI areas

        - No current Wildfire Development Permit Area; supports investigation of the feasibility of it for the Town of Oliver
- Town of Osoyoos
    - Official Community Plan Bylaw No. 1230, 2007
        - Last update – October 26, 2018
    - Section 14.7 Hillside and Wildfire Protection
        - Applicable developments in wildfire areas will be subjected to receiving a permit in accordance with the WIDPA
        - 14-13 Take appropriate measures to protect the public and development from potential rock fall, slope failure and wildfire hazards
    - Section 14.9 Wildfire Interface Development Area (WIDPA)
        - Applicable to any proposed development in areas with tree and/or other vegetation that in the Town's opinion could present a wildfire risk.
        - Eligible developments include all subdivisions, new buildings, and new building additions with footprints exceeding 10m^2, together with associated landscaping and other site improvements
- Village of Keremeos
    - Official Community Plan Bylaw No. 807, 2013
    - Section 13.0 Natural Hazards
        - No definitive measures around wildfire beyond noting the objective of reducing the threat of wildfire hazards to existing and proposed developments
- Town of Princeton
    - Official Community Plan Bylaw No. 808, 2008
    - Section 11.1.9 Fire Hazards
        - Require applicants of subdivision and development proposals to demonstrate FireSmart principles have been considered
        - Review existing studies and consider wildfire mitigation in areas where there is a perceived threat.
        - Coordinate with provincial ministries to improve the awareness of emergency forest fire response programs

        - Encourage new development adjacent to forested areas to take fire prevention measures upon the advice of the Town's Fire Department and appropriate government ministries
        - Support cooperative work between FLNRORD and the approving officer in evaluating subdivision applications in order to minimize the potential for fire damage in natural areas surrounding Princeton.
- RDOS Open Air Burning Regulations Bylaw No. 2364, 2005
    - *Currently under review to standardize the application process throughout the region*
    - Burning permits are required for the following fire protection areas:
        - Kaleden, Naramata, Okanagan Falls, Tulameen, and Willowbrook.
    - Open burning is not permitted between April 15 to October 15 of each year
    - Establishes definitions and parameters of open burning and campfires within the boundaries

2.5.4 Higher Level Plans and Relevant Legislation

The Okanagan Shuswap Land and Resource Management Plan (LRMP)[2] was completed in 2001 and relates to Crown land throughout the Okanagan Shuswap Natural Resource District (Province of British Columbia 2001). The LRMP makes several references to wildfire management and hazard reduction (Table 3), none of which impinge on the ability of local governments to undertake wildfire risk reduction. Flowing from the LRMP are orders pertaining to the establishment of resource management zones and old growth management objectives (Province of British Columbia 2007) and none of these orders impede RDOS from pursuing strategic wildfire mitigation efforts. Specific to the RDOS, these include orders related to:

- basic levels of coarse woody debris (CWD) areas;
- basic and enhanced levels of CWD areas;
- bighorn sheep areas;
- elk areas;
- marten areas;
- intensive recreation areas; and
- tourism areas.

[2] https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/thompsonokanagan-region/okanaganshuswap-lrmp/okanagan_shuswap_lrmp.pdf

Although the Merritt timber supply area (TSA) doesn't have an approved LRMP, the TSA has non-legal spatially identified old growth management areas (OGMAs) that meet the intent of legal targets under the Provincial Non-Spatial Old Growth Order (Province of British Columbia 2006).

Table 3 Wildfire references in the Okanagan-Shuswap Land and Resource Management Plan (2001).

Part 4 Community/Crown Interface (Page CCI 4-1)	
Sec 7	Protect populated areas from forest fire hazards in the wildland – urban interface, and protect the provincial forest from fires originating on contiguous private land.
Sec 7.1	The Ministry of Forests is to coordinate fire hazard reduction in the Interface zone through consultation with the public, licensed tenure holders, affected resource agencies, First Nations, and local government.
Sec 7.2	Where practical, coordinate and implement fire hazard reduction activities with priority areas for prescribed burning for ecosystem enhancement purposes.
Part 4 Ecosystem – Natural Disturbance Type 4 (page NDT4 4-9)	
Sec 10.1	Where practical, return fire to the NDT4a at historical fire cycle intervals by developing and implementing a burn plan that includes restoration and maintenance burning.
Sec 10.3	Develop and implement a plan to modify suppression on naturally occurring wildfires that meet impact prescriptions.
Sec 11.9	Develop a fire management plan for the NDT4a and b.
Sec 11.11	Develop and implement a plan to modify suppression on naturally occurring wildfires that meet impact prescriptions.
Part 4 Mountain Goat Habitat (page Wildlife_Goat 4-3)	
Sec 2.1	Where other resource values are not threatened, enhance early seral foraging opportunities by implementing a "let burn" policy for high elevation wild fires in inoperable areas that are on, or adjacent to, goat winter ranges.
Part 4 - Mule Deer Winter Range (page Wildlife_Mdeer 4-12/)	
Sec 3.4	Where practicable, utilize prescribed burns under specific conditions or mechanical treatments to enhance winter range forage values.

2.5.5 Ministry Plans

The Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) has prepared fire management plans for each Natural Resource District in the province, as required by ministry policy. Fire management plans are intended to address all wildfire-related issues within the natural resource district, particularly the desired interaction between resource management concerns and fire suppression requirements. It is important to note that district fire management plans are currently not public documents in the Kamloops

Fire Centre (KFC), although there are examples of District fire management plans elsewhere in the province available on the internet[3].

The current fire management plan for the Okanagan Shuswap Natural Resource District dates from 2015 and carries forward the 2014 wording with updates to spatial data only. The district fire management plan is a brief 15-page document that also includes high-level district mapping according to four broad "priority themes". The mapping themes are as follows:

- Theme 1 – Human Life and Safety
    - WUI areas (high, moderate and low structure density)
    - Evacuation routes and marshalling points
- Theme 2 – Critical Infrastructure and Property (that relates to maintaining Theme 1)
    - Energy generation and transmission, healthcare, first responder facilities, transportation, wildland structures etc.
- Theme 3 – High Environmental Cultural
    - Water resources, species at risk, cultural values
- Theme 4 – Resource Values
    - Ungulate winter range, old-growth management areas, timber, silviculture investments, range management, and visual quality areas

The Cascades Natural Resource District has a Landscape Fire Management Plan that dates back to 2014. The content is significantly different from the Okanagan Shuswap district fire management plan, in that it identifies *fire management units* on the landscape, as well as broad landscape draft fuel breaks.

3 Values at Risk

The BCWS wildfire glossary of terms (2016) describes *values at risk* as the specific or collective set of natural resources and human improvements/developments that have measurable or intrinsic worth and that could be destroyed or otherwise altered by fire in any given area. The concept of determining the value of something in relation to some level of wildfire risk is fraught with complication. The BC Forest Practices Board (2012) noted that assigning monetary value to natural resources is difficult and applied inconsistently across the province. This challenge becomes more complicated when considering non-consumptive values such as

[3] See Mackenzie Natural Resource District Fire Management Plan 2018 https://www.for.gov.bc.ca/ftp/DMK/external/!publish/Consultation%20Maps/FMP/Mackenzie%20FMP_2018_DRAFT.docx

wildlife habitat. Within the context of the CWPP, values at risk include human health and safety, facilities, services, cultural and natural resources etc. that may be negatively impacted by wildfire. This includes human life, property, critical infrastructure, high environmental and cultural values, and resource values.

3.1 Human Life and Safety

The 2016 Canadian Census indicates that there are 83,022 residents living within the RDOS. During the wildfire season, tourism and seasonal work creates an influx of people into the region. Periods of persistent fire load during this period can have notable impacts on the tourism and agricultural economies.

Wildfire smoke is of particular concern for the health and wellbeing of the public. Among a host of other constituents, wildfire smoke contains particulate matter (PM) which is primarily composed of organic carbon and black carbon components (Naeher, et al. 2007). The size of PM that biomass burning produces is usually fine particles less than 2.5 micrometers (μm), referred to as $PM_{2.5}$ (Duran 2014).

Although everyone responds to wildfire smoke exposure differently, the BC Centre for Disease Control (2018) identifies the following groups as being most at risk:

- people over 65;
- women who are pregnant;
- infants and small children;
- people with existing chronic respiratory conditions.

3.2 Critical Infrastructure

Publicly and provincially owned critical infrastructure (CI) are assets owned by the Provincial government, local government, public institution (such as health authority or school district), First Nation or Treaty First Nation that are:

- Essential to the health, safety, security or economic wellbeing of the community
- Essential to effective functioning of government
- Assets identified in a Local Authority Emergency Plan Hazard, Risk & Vulnerability and Critical Infrastructure assessment.

3.2.1 Electrical Power

The RDOS lies within the Fortis BC electricity service area and is interconnected with the BC Hydro transmission system in a number of locations. Major transmission lines traversing the RDOS include:

- BC Hydro 138 kV transmission line (L251) between Nicola substation and Similkameen
- BC Hydro 500 kV transmission line (L98) between Nicola substation and Vaseux Lake terminal
- BC Hydro 500 kV transmission line (L96) between Vaseux Lake terminal and the Kootenays
- Fortis BC 138 kV transmission line (43L) between Princeton and Oliver
- Fortis BC 69 kV transmission line (44L) between Oliver and Osoyoos
- Fortis BC 69 kV transmission lines (41L and 42L) from Oliver north to Summerland, via Kaleden to Anderson terminal
- Fortis BC transmission line from Anderson terminal north to Arawana and on to Kelowna.

3.2.2 Communications, Pipelines and Publicly Owned Buildings

As a large regional district, several telecommunications sites, pipelines and publicly owned buildings are located throughout RDOS. The RDOS maintains an E911 Fire Two-Way Radio Network to connect the regional fire dispatch service area to the Kelowna Fire Department Dispatch Centre. The RDOS infrastructure that comprises the fire two-way radio network is listed in Table 4. Natural gas transmission pipelines in the RDOS are part of the Fortis BC Pipeline System. A transmission pipeline runs from the BC Pipeline south through Area H to Princeton and east through the Similkameen Valley. Upon entering the Okanagan Valley, the pipeline branches northwards to Kelowna and east into the /Boundary/Kootenay. Key public buildings related to public safety are listed in Table 5, while K-12 schools are listed in Table 6.

Table 4 RDOS E911 fire two-way radio network infrastructure.

Site	Link, Repeater, or Base	Latitude	Longitude
Penticton School District 67 – DATA Centre	Communication HUB Links to Kelowna Dispatch / RDOS Network Access Distribution point	49°29'33.70"N	119°34'59.67"W
Apex Mountain	Link	49°22'51.00"N	119°54'53.92"W
Penticton SD Office	Link	49°29'33.62"N	119°34'59.61"W
Lost Moose	Link	49°28'46.31"N	119°30'27.36"W
Summerland Firehall	Repeater	49°36'11.00"N	119°40'57.01"W
Trout Creek Reservoir	Repeater	49°34'38.52"N	119°38'23.82"W
N'Kwala Mountain	Repeater	49°31'44.71"N	119°38'26.76"W
Kaleden Firehall	Repeater	49°23'27.00"N	119°35'46.00"W
OK Falls Firehall	Repeater	49°20'33.00"N	119°34'20.00"W
Willowbrook Firehall	Repeater	49°15'57.29"N	119°36'12.09"W
Wilson Mountain	Repeater	49°11'4.90"N	119°34'8.56"W
Anarchist Mountain	Repeater	49° 1'40.44"N	119°20'51.94"W
Pincushion Mountain	Repeater	49°13'37.00"N	119°48'20.00"W
Stirling Creek Site - Hedley	Repeater	49°21'2.48"N	120° 8'25.09"W
China Creek	Repeater	49°28'14.73"N	120°33'54.76"
Blakeburn Mountain	Repeater	49°31'7.25"N	120°44'16.81"W
Penticton Reservoir	Base/Interconnect	49°28'55.89"N	119°32'57.10"W
Summerland Fire Hall	Base/Interconnect	49°36'11.00"N	119°40'57.01"W
Naramata Fire Hall	Base/Interconnect	49°35'26.00"N	119°34'48.00"W
Penticton IB FH	Base/Interconnect	49°30'19.00"N	119°37'53.00"W
Kaleden Fire Hall	Base/Interconnect	49°23'27.00"N	119°35'46.00"W
OK Falls Fire Hall	Base/Interconnect	49°20'33.00"N	119°34'20.00"W
Willowbrook Fire Hall	Base/Interconnect	49°15'57.29"N	119°36'12.09"W
Oliver Fire Hall	Base/Interconnect	49°10'37.91"N	119°33'0.38"W
Osoyoos Fire Hall	Base/Interconnect	49° 1'56.68"N	119°28'6.99"W
Anarchist Fire Hall	Base/Interconnect	49° 1'16.00"N	119°22'39.00"W
Keremeos Fire Hall	Base/Interconnect	49°12'19.05"N	119°49'37.20"W
Hedley Fire Hall	Base/Interconnect	49°21'26.01"N	120° 4'35.12"W
Princeton Fire Hall	Base/Interconnect	49°27'30.14"N	120°30'36.36"W
Tulameen Fire Hall	Base/Interconnect	49°32'37.95"N	120°45'27.46"W
Hayes Creek Fire Hall	Base/Interconnect	49°42'45.85"N	120°13'43.32"W
East Gate Fire Hall	Base/Interconnect	49° 8'16.90"N	120°36'51.54"W
Erris Fire Hall	Base/Interconnect	49°32'24.92"N	120°26'12.46"W

Table 5 Key public buildings in the RDOS.

Fire Station	
Anarchist Mountain Fire Department	115 Grizzly Rd. Osoyoos
Kaleden Volunteer Fire Department	303 Lakehill Rd. Kaleden
Keremeos Volunteer Fire Department	513 7 St. Keremeos
Naramata Volunteer Fire Department	1095 Lower Debeck Rd. Naramata
Okanagan Falls Volunteer Fire Department	5013 11 Ave. Okanagan Falls
Tulameen & District Volunteer Fire Department	132 1 St. Tulameen
Willowbrook Volunteer Fire Department	39450 Fairview White Lake Rd. Oliver
Penticton Fire Department #201 Firehall	250 Nanaimo Ave. Penticton
Penticton Fire Department #202 Firehall	285 Dawson Ave. Penticton
Oliver Fire Department	369 Similkameen Ave. Oliver
Osoyoos Fire Department	9901 74 St. Osoyoos
Princeton Volunteer Fire Department	174 Penryn Ave. Princeton
Summerland Fire Department	10115 Jubilee Rd. West Summerland
Hedley Volunteer Fire Department	825 Scott Ave. Hedley
Hayes Creek Fire and Rescue	3950 Princeton Summerland Rd. Princeton
Penticton Indian Band Fire Department	841 Westhills Dr. Penticton
Apex Volunteer Fire Rescue	Apex Mountain
Eastgate Fire Protection	Eastgate
Erris Volunteer Fire Association	Princeton Summerland Rd.
RCMP	
RCMP – Summerland	9101 Pineo Ct., Summerland
RCMP – Penticton	1168 Main St., Penticton
RCMP – Oliver	425 Similkameen Ave., Oliver
RCMP – Osoyoos	16 Eagle Ct., Osoyoos
RCMP – Keremeos	2920 Highway 3, Keremeos
RCMP – Princeton	200 Highway 3, Princeton

Table 6 Schools within the RDOS.

District	School Name	Mailing Address	Community	Local Government
53	Cawston Primary School	517 School Rd	Cawston	RDOS Area B
	Okanagan Falls Elementary	1141 Cedar St	Okanagan Falls	RDOS Area D
	Oliver Elementary	809 School Ave	Oliver	Town of Oliver
	Osoyoos Elementary	8507 68 Ave	Osoyoos	Town of Osoyoos
	Osoyoos Secondary	5800 115th St	Osoyoos	Town of Osoyoos
	Sen Pok Chin	1155 SenPokChin Blvd	Oliver	Osoyoos Indian Band
	Similkameen Elem-Secondary	830 - 2nd Ave	Keremeos	Town of Keremeos
	Southern Okanagan Secondary	6140 Gala St	Oliver	Town of Oliver
	Tuc-el-Nuit Elementary	6648 Park Dr	Oliver	Town of Oliver
58	John Allison Elementary	499 Corina Ave	Princeton	Town of Princeton
	Princeton Secondary	201 Old Merritt Hwy	Princeton	Town of Princeton
	Vermilion Forks Elementary	99 Ridgewood Dr	Princeton	Town of Princeton
67	Carmi Elementary	400 Carmi Ave	Penticton	City of Penticton
	Columbia Elementary	1437 Allison St	Penticton	City of Penticton
	Concordia Lutheran School	2800 South Main St	Penticton	City of Penticton
	Giant's Head Elementary	10503 Prairie Valley Rd	Summerland	District of Summerland
	Holy Cross School	1298 Main St	Penticton	City of Penticton
	Kaleden Elementary	152 Linden Ave	Kaleden	RDOS Area I
	KVR Middle School	300 Jermyn Ave	Penticton	City of Penticton
	Naramata Elementary	3660 8th St	Naramata	RDOS Area E
	Parkway Elementary	225 Kinney Ave	Penticton	City of Penticton
	Penticton Christian School	102-96 Edmonton Ave	Penticton	City of Penticton
	Penticton Secondary	158 Eckhardt Ave E	Penticton	City of Penticton
	Princess Margaret Secondary	120 Green Ave W	Penticton	City of Penticton
	Queens Park Elementary	330 Power St	Penticton	City of Penticton
	Skaha Lake Middle School	110 Green Ave W	Penticton	City of Penticton
	Summerland Middle School	13611 Kelly Ave	Summerland	District of Summerland
	Summerland Montessori School	10317 Prairie Valley Rd	Summerland	District of Summerland
	Summerland Secondary	9518 Main St	Summerland	District of Summerland
	Trout Creek Elementary	5811 Nixon Rd	Summerland	District of Summerland
	Unisus International School	7808 Pierre Dr	Summerland	District of Summerland
	Unisus Junior School	7808 Pierre Dr	Summerland	District of Summerland
	Uplands Elementary	145 Middle Bench Rd S	Penticton	City of Penticton
	West Bench Elementary	1604 West Bench Dr	Penticton	City of Penticton
	Wiltse Elementary	640 Wiltse Blvd	Penticton	City of Penticton

3.2.3 Water and Sewage Infrastructure

Typically, water and wastewater treatment plants are resistant to damage sustained through direct flame impingement. Of greater concern is typically the disruption of power supply or access to the site for maintenance and testing that can be sustained by fire effects. The RDOS owns and manages eight water systems,

- Faulder
- Naramata
- Sage Mesa
- West Bench

- Sun Valley
- Gallagher Lake
- Olalla Water
- Willowbrook

and two sanitary sewer systems,

- Okanagan Falls
- Northwest Osoyoos

3.3 High Environmental and Cultural Values

The South Okanagan-Similkameen is characterized by a rich and diverse natural and cultural landscape. Throughout this landscape are a plethora of environmental and cultural values, with diverse partners and stakeholders.

3.3.1 Drinking Water Supply Area and Community Watersheds

Within the RDOS are nineteen Community Watersheds, as listed in Table 7.

Table 7 Community watersheds within the RDOS.

Electoral Area	Community watershed name	Source	Area within AOI (ha)
Area A	Rancher	Rancher Creek	444
Area D	Ellis	Ellis Creek	15,292
Area E	Chute	Chute Creek	1,889
	Penticton	Penticton Creek	17,391
	Naramata	Naramata Creek	3,387
	Robinson	Robinson Creek	1,942
Area F	Trout	Trout Creek	71,616
	Shingle	Shingle Creek	4,560
	Farleigh	Farleigh Lake	2,154
Area G	Olalla	Olalla Creek	2,666
Area H	Dillard	Dillard Creek	3,872
	Lee	Lee Creek	465
	Anderson	Anderson Creek	275
	Hackett	Hackett Creek	164
	Thomas	Thomas Brook	44
	Bell	Bell Creek	344
	Cable	Cable Creek	582
	Sandstone	Sandstone Creek	176
Area I	Keremeos	Keremeos Creek	121

3.3.2 Cultural Values

Due to an extensive and uninterrupted First Nation presence throughout the Okanagan-Similkameen, wildfire and associated suppression operations have the potential to inadvertently seriously impact or destroy cultural heritage resources.

It can be challenging to navigate the requirements of the Heritage Conservation Act (HCA) during the critical initial attack phase of a wildfire response, but a basic awareness of what to look for can help to ensure that cultural heritage resources aren't impacted by suppression actions. Archaeological sites in British Columbia that date to 1846 or earlier are protected from alteration of any kind by the Heritage Conservation Act (HCA) (1996). The provisions of the HCA apply to archaeological sites located on both public and private land, known and unknown, and are binding on government.

For good reason, the exact locations of known sites and resources are often privileged information, but through agreement and trust, general information regarding areas could be shared. From there, it is incumbent on personnel who are actively working in the field to be able to identify resources so that suppression actions can be planned or altered in such a way as to not to contravene the HCA.

Other historical values in the RDOS include the Grist Mill at Keremeos on Keremeos Creek, registered as a designated site at the provincial level, and the Great Northern Railway Bridge (Red Bridge), recognized on the Community Heritage Register (Keremeos).

3.3.3 High Environmental Values

Although many diverse examples of high environmental values are found throughout the RDOS, perhaps the rarest and most unique is the Antelope-brush ecosystem found in the south Okanagan. Unique amongst shrubsteppe habitats, the Antelope-brush ecosystem of the south Okanagan is a fraction of its former extent. Agricultural and urban expansion have reduced the footprint of this rare ecosystem, in turn leading to a high proportion of threatened and endangered species found within it.

3.4 Other Resource Values

The Okanagan Valley and the Similkameen Valley together have approximately 9,487 acres (3839 hectares) of vineyards planted, and account for more than 80% of all wine produced in

British Columbia[4]. Between the two, there are 200 licensed grape wineries situated along Okanagan Lake, its tributaries, and downstream lakes – Skaha, Vaseux, and Osoyoos – and surrounding Keremeos and Cawston.

The region also accounts for a large portion of BC's production of fruits and vegetables. BC Tree Fruits Cooperative alone operates various facilities across the Okanagan and Similkameen Valley. There is a packing facility in Oliver, a receiving facility in Summerland, Penticton and Keremeos, and a controlled atmosphere storage facility Keremeos, Summerland and Oliver. The company utilizes 400+ local growers for their products including apples, pears, cherries, apricots, peaches, prunes, plums and nectarines[5].

Numerous hiking and bike trails are established throughout the AOI and play an important role as a recreation resource for residents and tourists. The Kettle Valley Rail Trail snakes its way from Princeton to Penticton, before heading north towards Kelowna (via Naramata) continuing onwards to the east. In 2003, wildfires impacted much of the trail including the destruction of several trestles and bridge decks east of Kelowna. The resultant dead standing timber also has led to additional required safety improvements to allow for the trail's continued use by locals and tourists.

The RDOS hosts two ski resorts, Mt Baldy to the east of Osoyoos and Apex Mountain the west of Penticton. Skaha bluffs, located to the east of Skaha Lake, is another popular outdoor recreational site – particularly for climbers.

3.5 Hazardous Values

The following are known sites with hazardous values. Operators of each of these sites or facilities should have their own emergency plans in place, if they do not already have so:

- Landfills
    - Okanagan Falls*
    - Oliver
    - Campbell Mountain*
    - Summerland*
    - Osoyoos
    - Princeton
    - Keremeos

[4] https://winebc.com/discover-bc-wine-country/okanagan-valley/
[5] http://www.bctreefruits.com

- Composting Facilities (includes *)
    - Osoyoos Compost
    - Keremeos Compost
    - Mission Hill Winery/Indian Rock Vineyard
    - Mission Hill Winery/Oliver Vineyard
    - Southern Plus Feedlots (Oliver)
    - Private mushroom facilities in Princeton and East Gate
- Industry
    - Copper Mountain (Princeton)
    - Eagle Valley Fuel Pellets (Princeton)
    - Princeton Wood Preservers Ltd.

4 Wildfire Threat

The following is a summary of the factors that contribute to an understanding of the wildfire threat around a community. These factors include natural fire regime and ecology, Provincial Strategic Threat Analysis, and a local wildfire risk analysis. Risk assessment for wildfire and its impacts to communities considers both the likelihood of a wildfire and the potential consequence associated with that likelihood.

4.1 Fire Regime, Fire Weather and Climate Change

The RDOS is an active fire environment where conditions often exist during the summer months where there is potential for losses to the public. When assessing the wildfire situation of the region, past conditions offer an indication of potential future conditions in the near term, and climate change scenarios must be incorporated when considering increasing future community resilience.

4.1.1 Fire Regime and Fire Weather

The ecology of the RDOS has been shaped by the full range of natural disturbance, from frequent low-intensity, stand-maintaining processes, to rare, stand-initiating events. The AOI is characterized by a rich diversity of natural disturbance type (NDT) classifications. The NDT classification (Table 8) of an area provides an illustration of the magnitude and frequency of natural disturbance (wildfires and windstorms, predominantly) across the land base.

Table 8 Natural disturbance type classification in British Columbia.

Natural Disturbance Type (NDT)	Description
NDT1	Ecosystems with rare stand-initiating events
NDT2	Ecosystems with infrequent stand-initiating events
NDT3	Ecosystems with frequent stand-initiating events
NDT4	Ecosystems with frequent stand-maintaining fire
NDT5	Alpine Tundra and Subalpine Parkland ecosystems

In terms of natural disturbance, a distinction is drawn between stand-initiating and stand-maintaining events. Stand-initiating events typically terminate the existing forest and induce secondary succession to produce a new forest. Stand-maintaining events serve to keep successional processes stable (Province of British Columbia 1995). In wildfire terms, high intensity fire behaviour, such as intermittent or continuous crown fire, would be considered a stand-initiating event. Conversely, a low intensity surface fire consuming understory fuels while retaining a mature overstory is considered a stand-maintaining event.

These distinctions are important when assessing the wildfire history of an area. The absence of frequent stand-maintaining processes can result in a cascading series of ecological responses, including forest health, habitat and fuel loading issues. In the NDT4, low-intensity (i.e. surface fire) fire return intervals historically ranged from 4 to 50 years (Province of British Columbia 1995). Forest protection policies centered around aggressive fire suppression have resulted in a drastically reduced frequency (or absence) of fire in ecosystems that are dependant (i.e. maintained) by frequent, low-intensity surface fires.

Stand-initiating fires (i.e. crown fires) in Ponderosa pine dominated stands were historically rare, with return intervals of at least 150 to 250+ years (Province of British Columbia 1995). The longer a fire-maintained stand goes without fire maintenance, the greater the likelihood that a future fire occurrence will be a stand-initiating disturbance. From a firefighting standpoint this increasingly deteriorating condition can result in wildfires that require significantly more suppression effort and cost to control.

Mid-to-high elevation forests are typically characterized as NDT 1 or 2, with the occurrence of fire being infrequent or rare but with a higher relative severity that results in extensive mortality

and the initiation of a new forest. In terms of fire behaviour, these fire regimes are typically characterized by high intensity during conditions that are conducive to intermittent or continuous crown fire.

Table 9 Distribution of Canadian Forest Fire Danger Rating System - Fire Behaviour Prediction (FBP) System in the RDOS.

FBP Fuel Type	Area (ha)	%
C-3 Mature Jack or Lodgepole Pine	384,046	37%
C-7 Ponderosa Pine/Douglas-fir	305,833	30%
O-1a Matted/Cut Grass O-1b Standing Grass	194,748	19%
Non-fuel (water, urban, cultivation etc.)	57,330	6%
S-1 Jack or Lodgepole Pine Slash	38,392	4%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	25,533	2%
D-1 Leafless Aspen D-2 Green Aspen	13,175	1%
C-2 Boreal Spruce	9,035	1%
C-4 Immature Jack or Lodgepole Pine	3,104	0.3%
S-2 White Spruce/Balsam Slash	2,139	0.2%
C-5 Red and White Pine	1,476	0.1%
C-1 Spruce-Lichen Woodland	92	0.01%
	1,034,903	100%

Eight BCWS fire weather stations were reviewed for the RDOS CWPP (Table 10). Generally, the RDOS area is adequately represented by the existing BCWS fire weather station locations, however several former stations were decommissioned over the years, resulting in blind spots. Fire weather stations that formerly existed at Stemwinder and Chain Lakes could help to fill these fire weather observation gaps if re-established. The RDOS may benefit from the re-establishment of the Stemwinder and Chain Lakes fire weather stations through the provision of fire weather data that is more representative of the conditions in the Lower Similkameen and Princeton-Summerland areas, respectively. These benefits would include better weather data for future iterations of the PSTA covering these areas. For example, the closest fire weather station for the Lower Similkameen, including Keremeos, is Ashnola, which is at a much higher elevation (1683 m) than the populated areas in the Lower Similkameen valley bottom. The ramifications of maintaining the status quo (i.e. not re-establishing the Stemwinder and Chain

Lakes fire weather stations) may be negligible compared to interpolation between multiple fire weather stations and adjusting for topographical influences (which is partly how fire weather inputs area "smoothed out" across vast areas to produce the PSTA). However, given that local governments are beholden to the provincial fire weather station network and the wildfire risk analyses that are informed therefrom in their approach to wildfire risk reduction, it is reasonable to consider whether adequate fire weather station representation exists.

Table 10 BC Wildfire Service active fire weather stations representative of the RDOS.

Station Name	Latitude	Longitude	Elevation	Install Date
Allison Pass	49.0623	-120.7674	1215m	May 10, 1989
Ashnola	49.1390	-120.1844	1683m	September 20, 1991
Aspen Grove	49.9481	-120.6210	1065m	November 29, 1998
August Lake	49.4334	-120.4571	855m	May 26, 2003
Brenda Mines	49.8684	-119.9925	1476m	June 14, 1989
McCuddy	49.1483	-119.4150	1067m	August 10, 1989
Penticton RS	49.5183	-119.5533	427m	August 16, 1988
Thynne	49.7151	-120.8660	1407m	June 7, 1990

For the purposes of CWPPs in BC, fire weather conditions are described in terms of the Fire Danger Class. Fire Danger Class is defined in the Wildfire Regulation and is a rating derived from outputs of the Canadian Forest Fire Weather Index (FWI) System. Although the sole intent of the Fire Danger Class rating scheme is to restrict high risk activities (primarily industrial) occurring on or about forest and grassland areas, the use of Fire Danger Class has been extended to the CWPP realm as a straightforward means of characterizing fire weather conditions in an area represented by a weather station.

Fire Danger Class is determined by comparing the Buildup Index (BUI) to the Fire Weather Index (FWI) in one of three tables presented in the Wildfire Regulation. Each table is specific to one of three broad Danger Regions in BC; RDOS is situated in Danger Region 3, along with each of the fire weather stations that were included in this analysis. The actual Fire Danger Classes are numerical ratings 1-5, in ascending order of severity. An illustration of the various inputs and components from which Fire Danger Class is derived is presented in Figure 3.

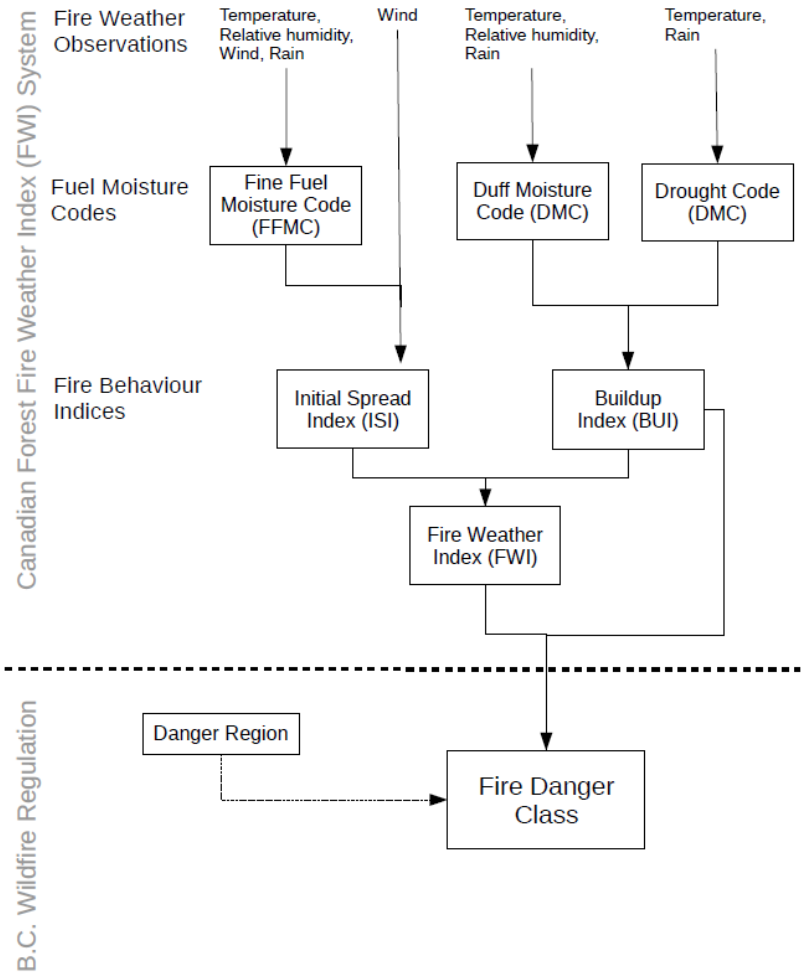

Figure 3 Fire Danger Class methodology.

A Fire Danger Class report for each of the eight fire weather stations analysed has been prepared (see Figures 4-11). The Fire Danger Class reports illustrate the number of days per year when the Fire Danger Class was rated 4 or 5. The RDOS is situated in Danger Region 3, which has the following BUI and FWI ranges for Fire Danger Class 4 and 5:

- BUI: 51 – 201+
- FWI: 17 – 47+

Of the eight fire weather stations analysed, all but one (August Lake) indicate an increasing linear trend of Fire Danger Class 4 and 5 days. The August Lake fire weather station was established during the 2003 fire season, while the other seven stations were commissioned much earlier. With 2003 being a particular dry summer (and active fire season), the linear trend of the relatively short dataset of August Lake is still influenced by the initial year of activation.

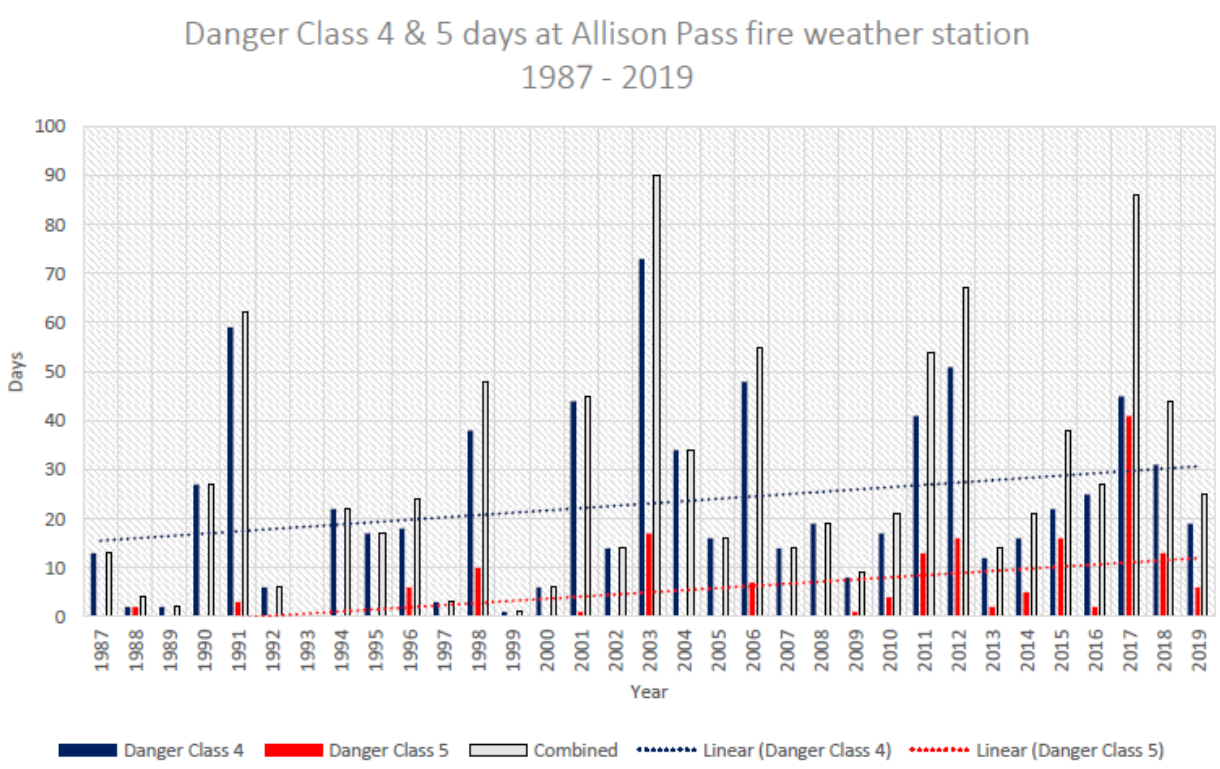

Figure 4 Fire Danger Class 4 and 5 report for the Allison Pass fire weather station.

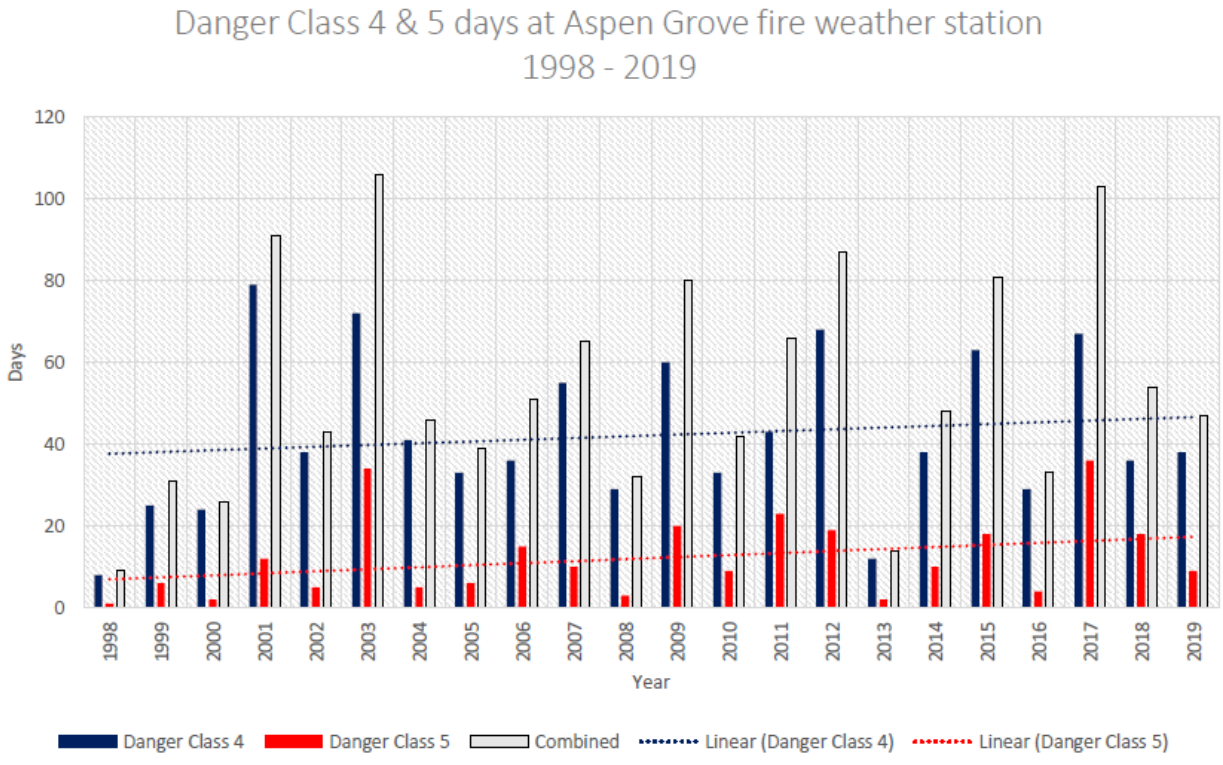

Figure 5 Fire Danger Class 4 and 5 report for the Aspen Grove fire weather station.

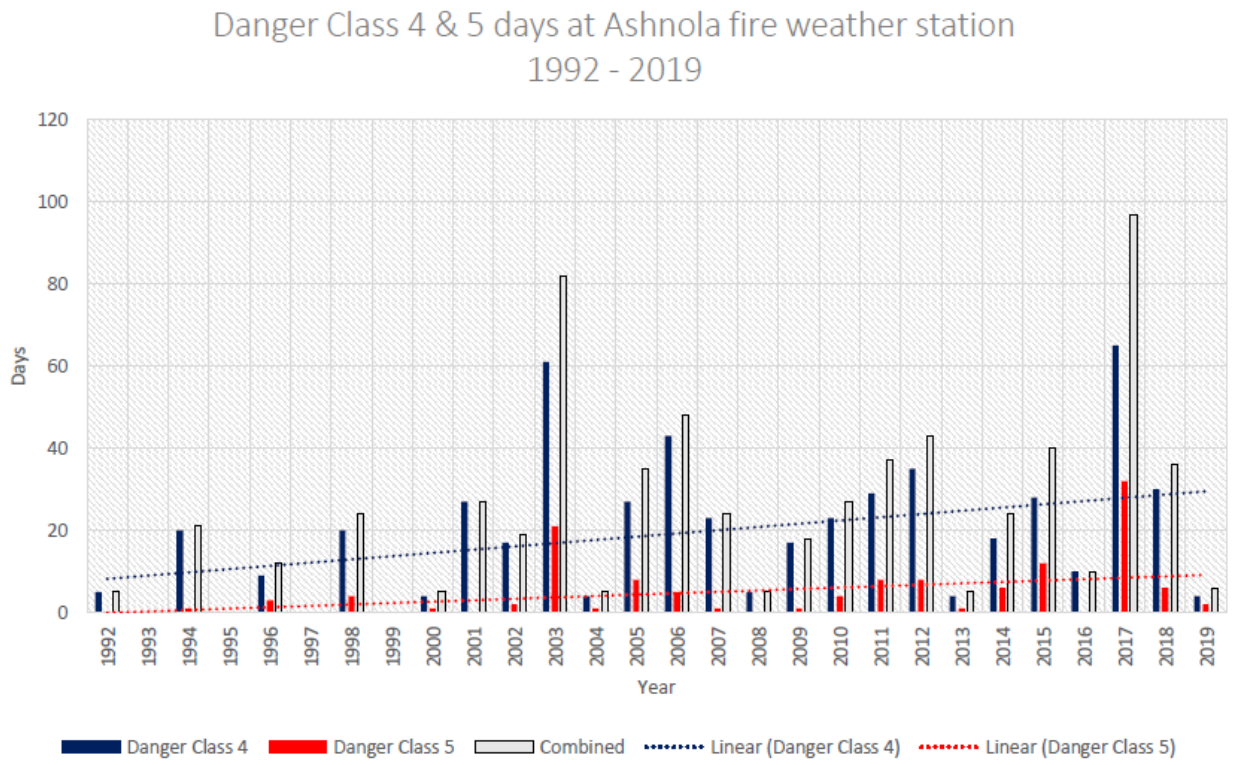

Figure 6 Fire Danger Class 4 and 5 report for the Ashnola fire weather station.

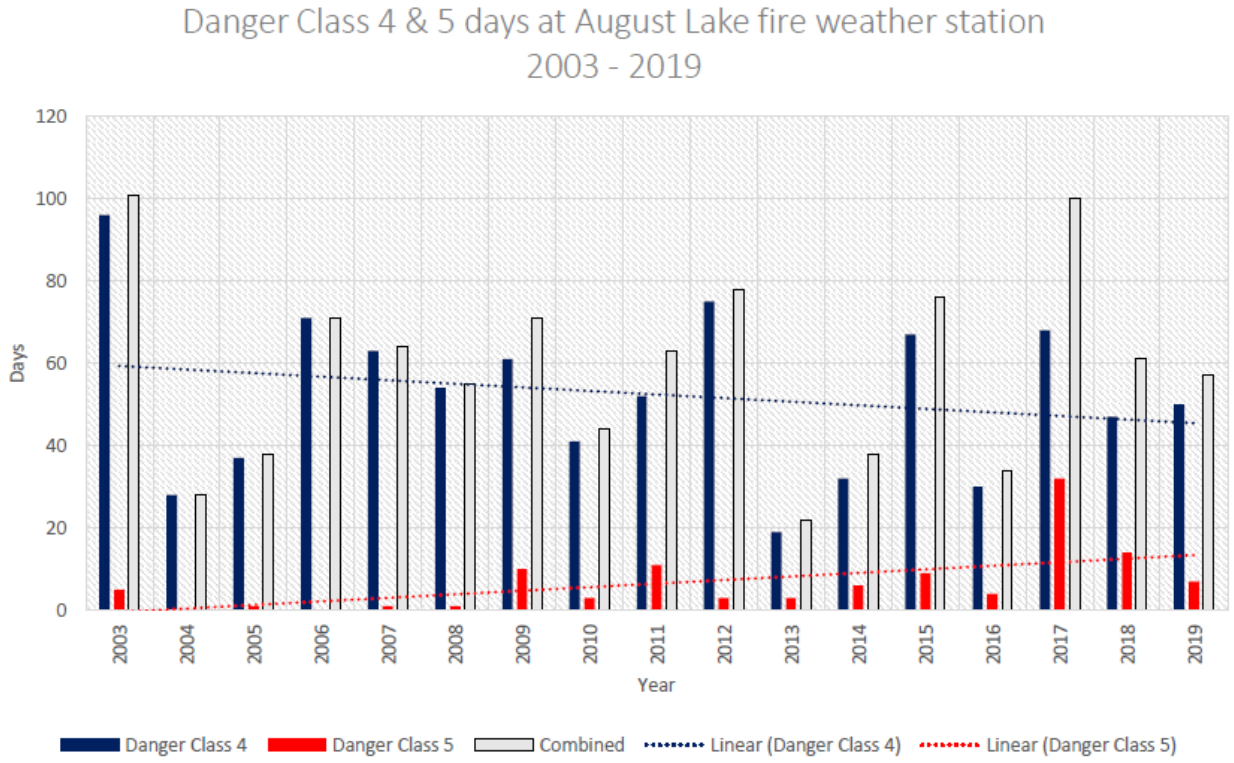

Figure 7 Fire Danger Class 4 and 5 report for the August Lake fire weather station.

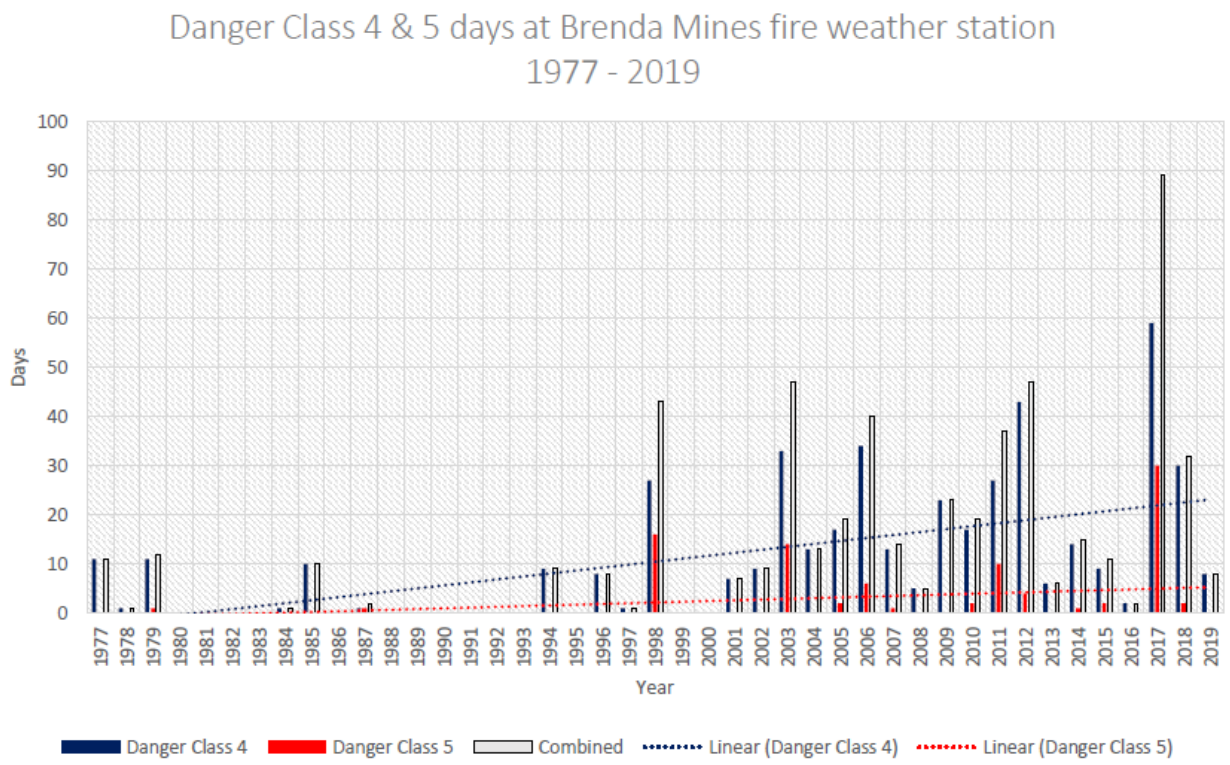

Figure 8 Fire Danger Class 4 and 5 report for the Brenda Mines fire weather station.

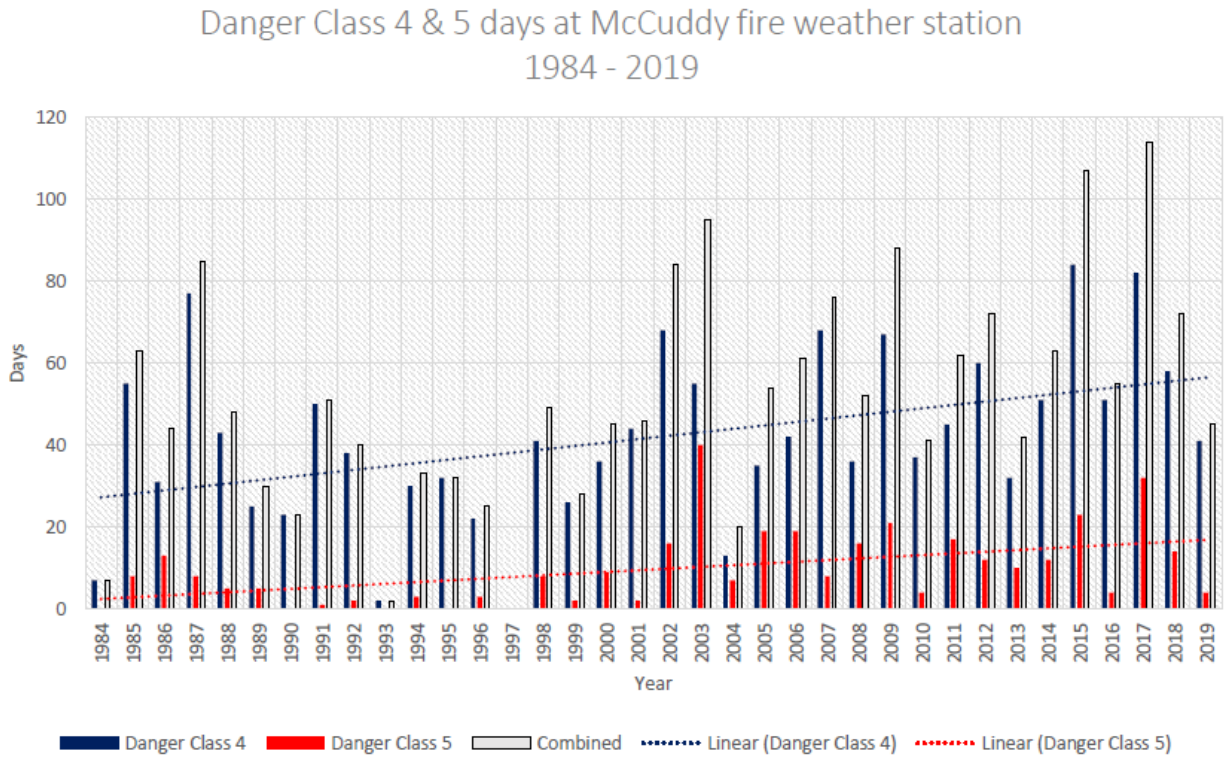

Figure 9 Fire Danger Class 4 and 5 report for the McCuddy fire weather station.

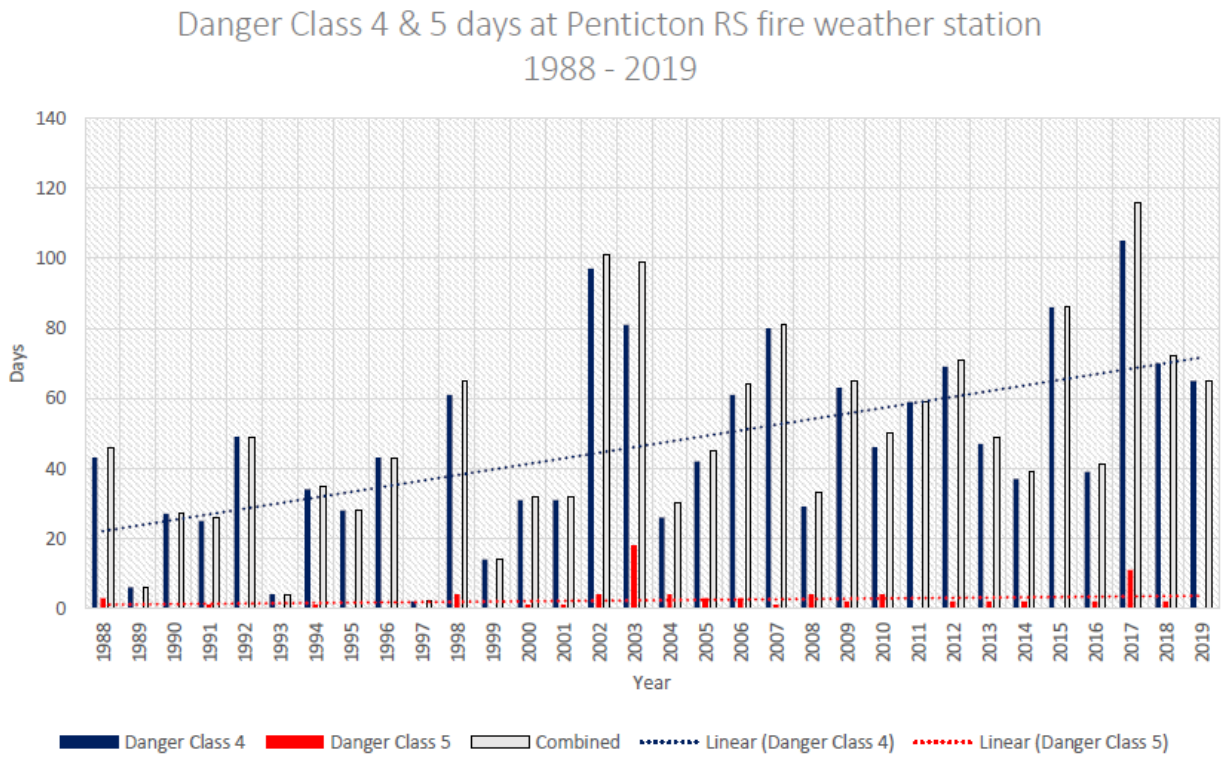

Figure 10 Fire Danger Class 4 and 5 report for the Penticton RS fire weather station.

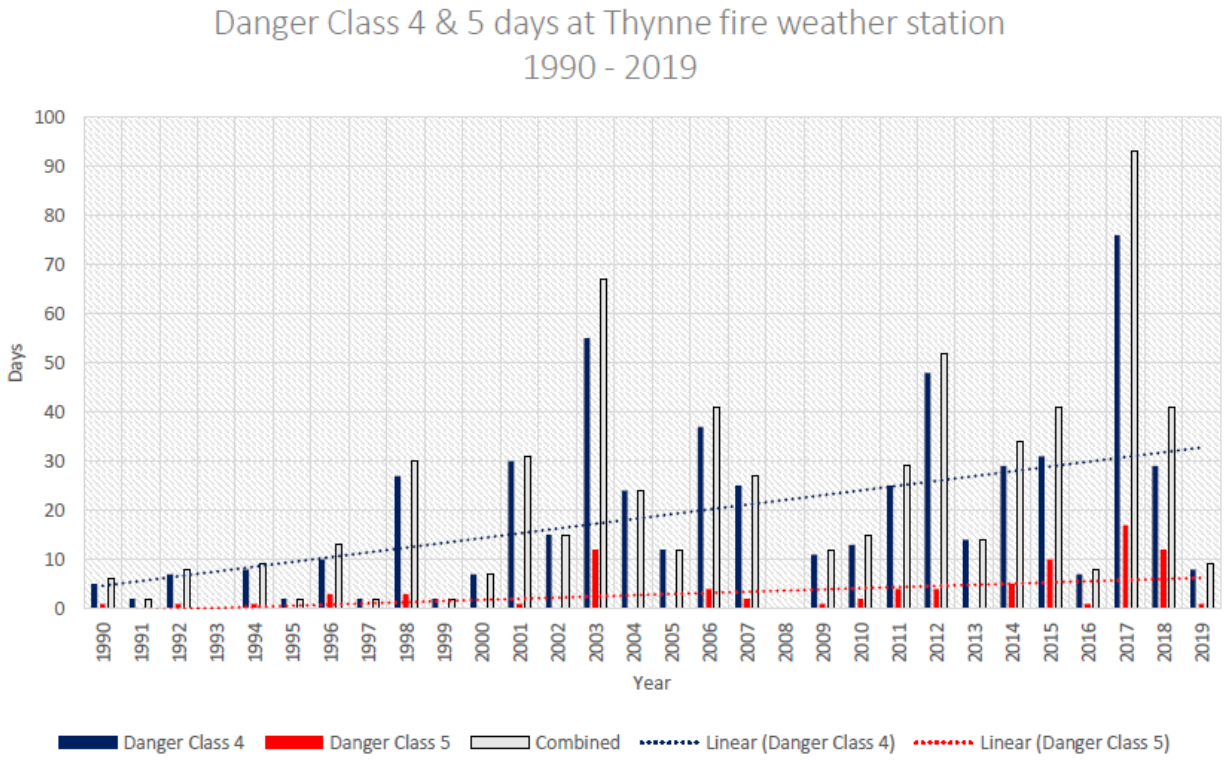

Figure 11 Fire Danger Class 4 and 5 report for the Thynne fire weather station.

4.1.2 Climate Change

The Pacific Climate Impacts Consortium (PCIC) is based at the University of Victoria and conducts quantitative studies on climate change and climate variability impacts for stakeholders in the Pacific and Yukon regions. Through analysis and interpretation of a variety of global climate models, PCIC serves to bridge the gap between climate research and practical application for a variety of end users. To do this, PCIC has several analysis tools available, including the Plan2Adapt toolkit, as well as the more detailed Regional Analysis Tool (Pacific Climate Impacts Consortium 2012).

The future regional impacts of climate change are far from certain and projections are based on the best available models and information. For example, although the range of modelled future summer temperature increase is somewhat broad (Figure 12), the upward trend is conspicuous. Conversely, the range of modelled summer precipitation change (Figure 13) shows a more muddled range of projections. As with any set of models, as more data becomes available and emissions scenarios become more refined, future impacts will be brought into sharper focus.

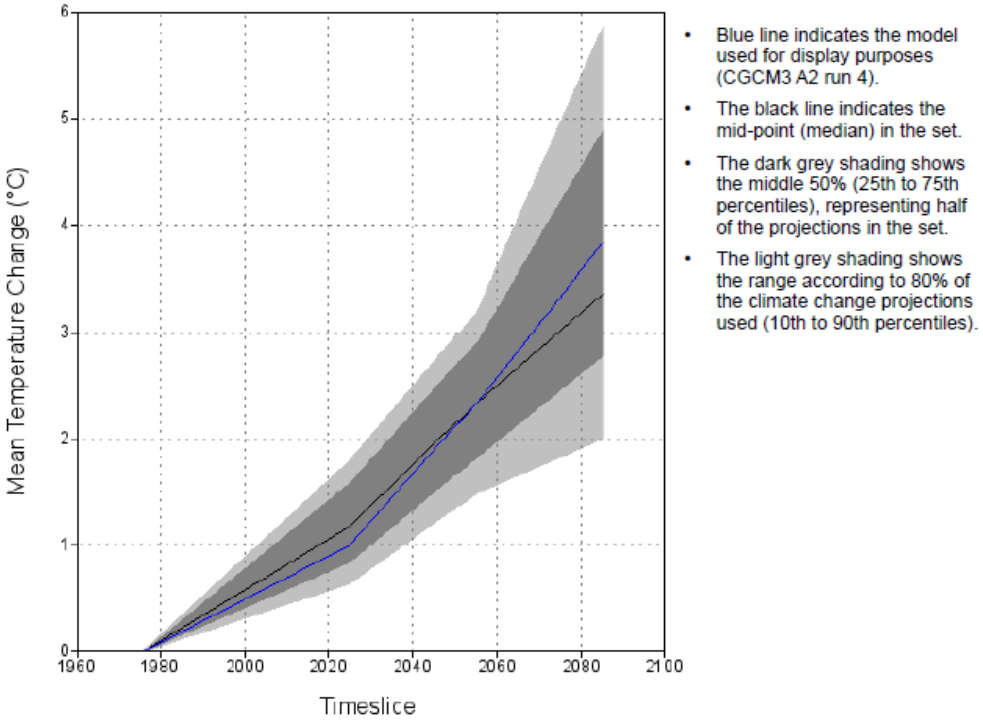

Figure 12 Range of projected summer (June, July, August) temperature change over three time periods (2020's, 2050's and 2080's) for the Okanagan-Similkameen. This figure is produced from a set of Global Climate Model (GCM) projections and represents the range of modelled outputs. Figure adapted from Pacific Climate Impacts Consortium, University of Victoria.

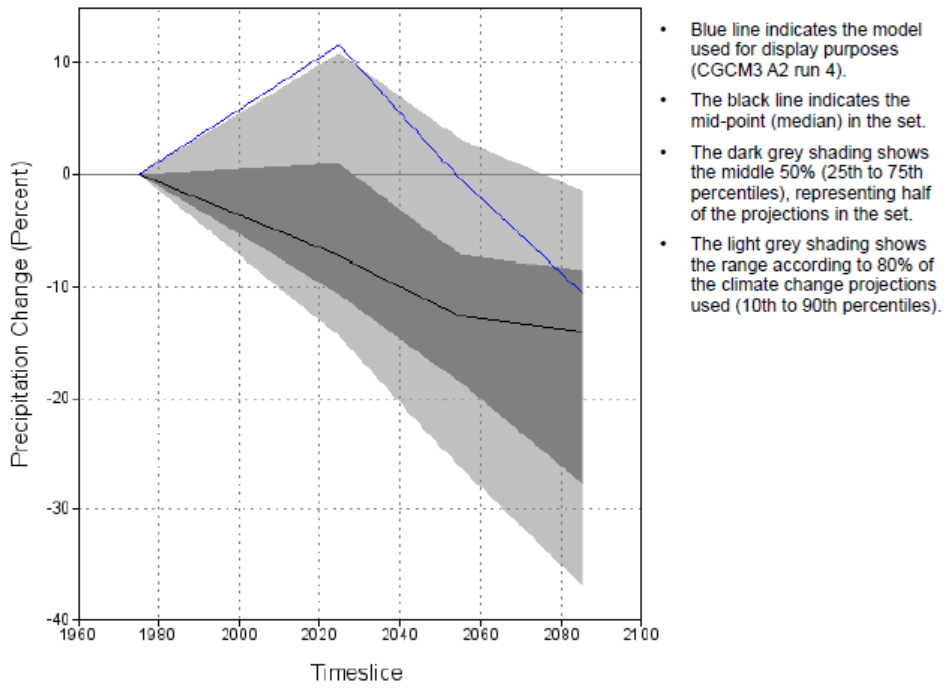

Figure 13 Range of projected summer (June, July, August) precipitation change over three time periods (2020's, 2050's and 2080's) for the Okanagan-Similkameen. This figure is produced from a set of Global Climate Model (GCM) projections and represents the range of modelled outputs. Figure adapted from Pacific Climate Impacts Consortium, University of Victoria.

The PCIC (2013) has drafted a set of potential climate impacts for the Okanagan-Similkameen in the 2050s, including:

- Increase in hot and dry conditions
- Increase in temperature
- Longer dry season
- High intensity precipitation
- Decrease in snowpack
- Possible changes in vegetation productivity

From a wildland fuel perspective, these impacts could result in a variety of ecological changes. Long term changes in moisture regimes can affect forest health and species distribution. Ecological communities may begin to migrate northwards or to higher elevations as site suitability and disturbance patterns shift. Already dry ecological zones may become drier and more prevalent at higher elevations, making an already fire-prone landscape more extensive.

As much of the south Okanagan valley bottom and exposed slopes are already characterized by relatively light grass fuels, climate change induced upslope migration of treed areas may have little effect on the overall wildfire threats posed to the WUI. In fact, such a shift might actually confine high-intensity fire to higher elevations over the long term. However, in the

wake of ecological migration, dead and downed fuel loading would most likely create a window of time of increased fuel hazard attributable to increased surface fuel loading, something akin to the recent effects of Western pine beetle on Ponderosa pine stands in the area.

4.2 Provincial Strategic Threat Analysis

The Provincial Strategic Threat Analysis (PSTA) is a provincial-scale analysis that attempts to characterize wildfire threat across BC. The analysis combines historical fire density, potential spotting impacts and predicted head fire intensity to produce a wildfire threat score. These scores are grouped into ten threat classes, ranging from 1 to 10, or Nil to Extreme. The PSTA layer is intended to serve as a starting point from which to design and conduct more detailed sampling to further characterize wildfire threat to communities.

To determine the overall PSTA Threat Rating, historical wildfire density, head fire intensity (HFI) and spotting impact are combined using a weighted averaging process. Weights are assigned as 30% fire density, 60% HFI (90th percentile fire weather index (FWI) values) and 10% spotting impact. These weighted values were added together to produce a final fire threat rating and assigned to 10 classes to produce a detailed map of fire threat rating throughout British Columbia.

The 10 threat classes represent increasing levels of overall fire threat (i.e. the higher the number, the higher the threat). PSTA Threat Class 7 is considered to be a threshold, with the most severe threat classes being Class 7 and higher. Areas rated as Class 7 or higher are locations where the fire intensity, frequency and spotting can be severe enough to potentially cause catastrophic losses in any given wildfire season, where those ratings overlap with significant values at risk. As a high-level "window view" of fire threat, PSTA classification is further refined during the CWPP development process (e.g. through GIS analysis described in Appendix 1.5 and by ground-truthing with WUI Wildfire Threat Assessment plots) to determine a more granular local wildfire threat assessment, which is comprised by the Fire Behaviour Threat Classification and the WUI Threat Classification, as described in Section 4.3.

4.2.1 Fire History

Fire history tells the story of the relationships between fire behaviour, landscape ecology, management policy (including fire suppression), human development and other land-use

changes throughout the area. Canada has a persistent history of wildfire on the landscape. The BCWS maintains a database of wildfires dating back to the early 1900s. Fire history data for fires that occurred prior to 1950 are limited to larger perimeters only and does not include fires that may only have been spot sized. These perimeters have been digitized from a variety of sources, some dating back to linen maps. From 1950 onwards, the wildfire dataset becomes more complete, capturing fires of all size classes and provides a more accurate picture of fire occurrence trends.

The fire history dataset is by no means perfect. Occasionally historical wildfires plot within lakes and there are sporadic discrepancies in information between point layers and perimeter layers for a given fire, but generally the dataset provides an adequate basis from which to conduct a historical fire analysis.

In the AOI between 1950 and 2019 a total of 6,717 wildfires are recorded in the provincial fire history dataset. Fire cause is fairly evenly split, with 54% being human-caused, and the remaining 46% caused by lightning. On average, 45 lightning fires and 52 person-caused fires occur each year within the RDOS, as recorded in the provincial dataset. The most wildfires in the AOI in a one-year period occurred in 1970, with 345 total wildfires. The 1970 fire season also saw the highest number of lightning fires (254), while the most person-caused wildfires (103) occurred in 1977. Aggregated fire occurrences for each Electoral Area are presented in Figure 14, while Appendix 3 contains a more complete breakdown of lightning and person-caused fires by Electoral Area.

When pre-1950 perimeter data is included in an annual area burned analysis of the AOI (Figure 15), we see the graph is bookended by two prominent clusters of peaks with large fires early in the dataset, followed by occasional smaller peaks, and most recently a prominent spike attributed to the 2018 fire season. The largest wildfire to date in the AOI occurred in 1929 and burned 33,895 ha. Annual area burned in each Electoral Area are presented in Figures 16-24.

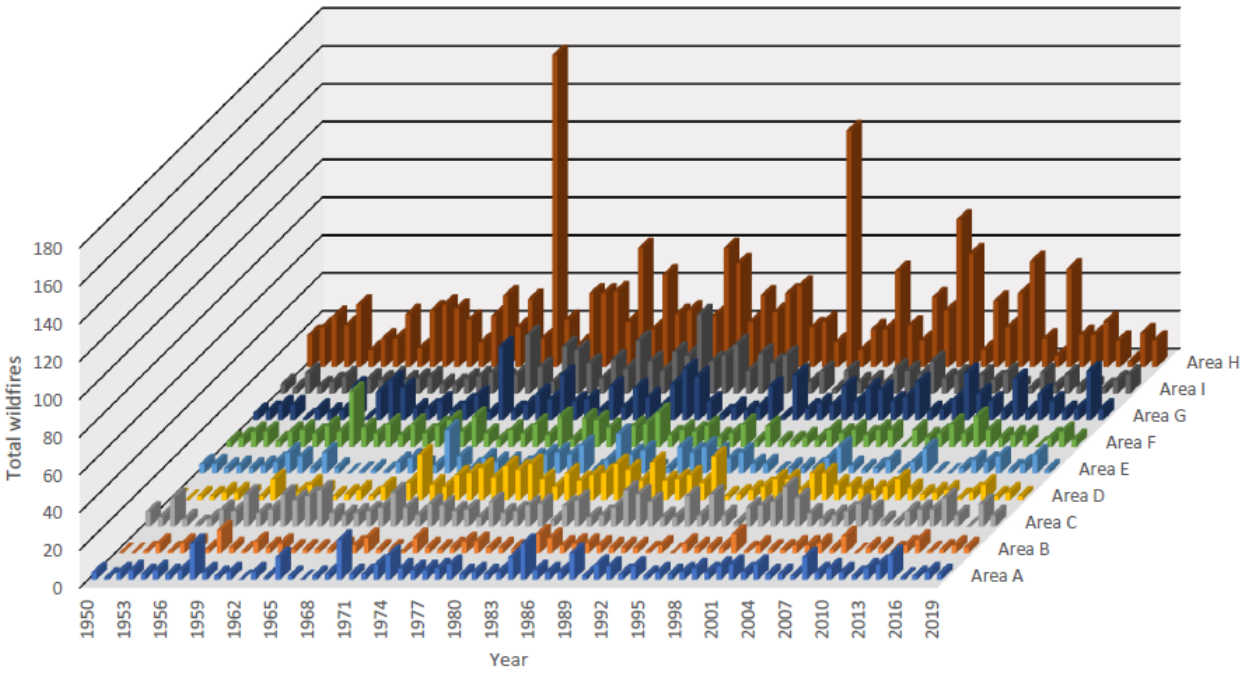

Figure 14 Annual wildfire occurrence (lightning and person-caused) in RDOS Electoral Areas from 1950 to 2019.

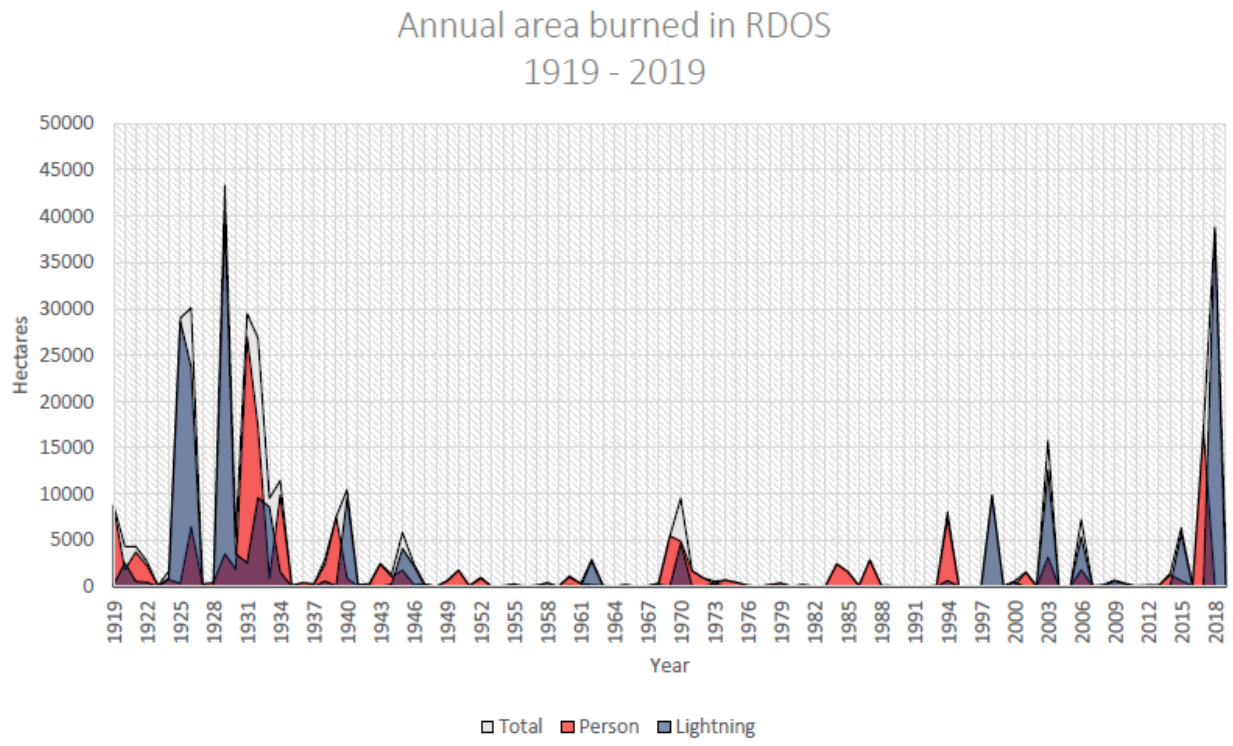

Figure 15 Annual area burned within the RDOS from 1919.

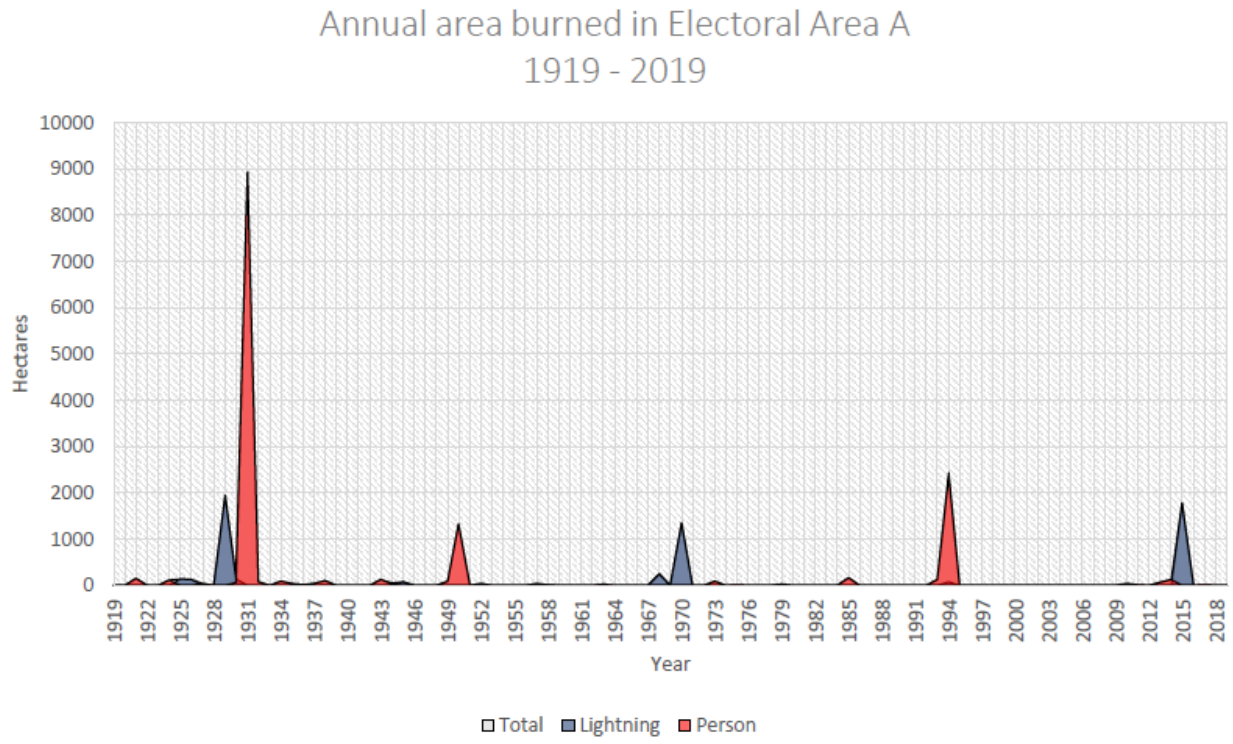

Figure 16 Annual area burned within the RDOS Electoral Area A from 1919.

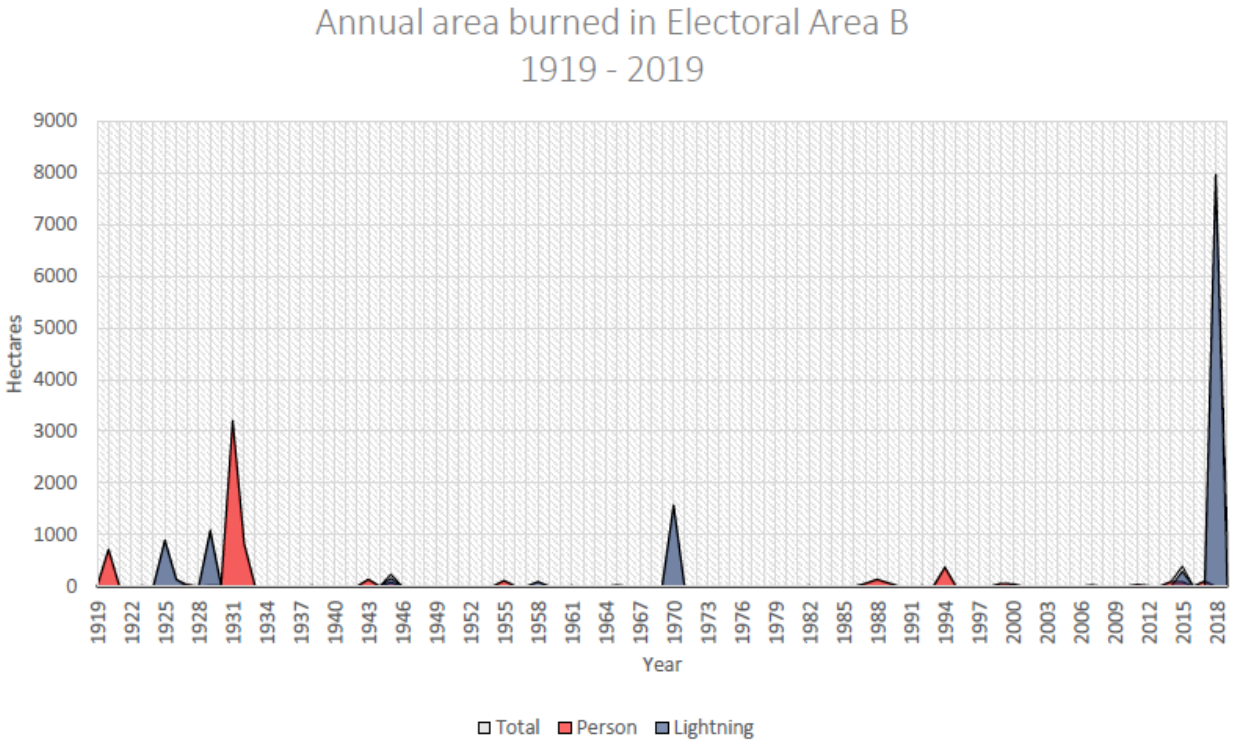

Figure 17 Annual area burned within the RDOS Electoral Area B from 1919.

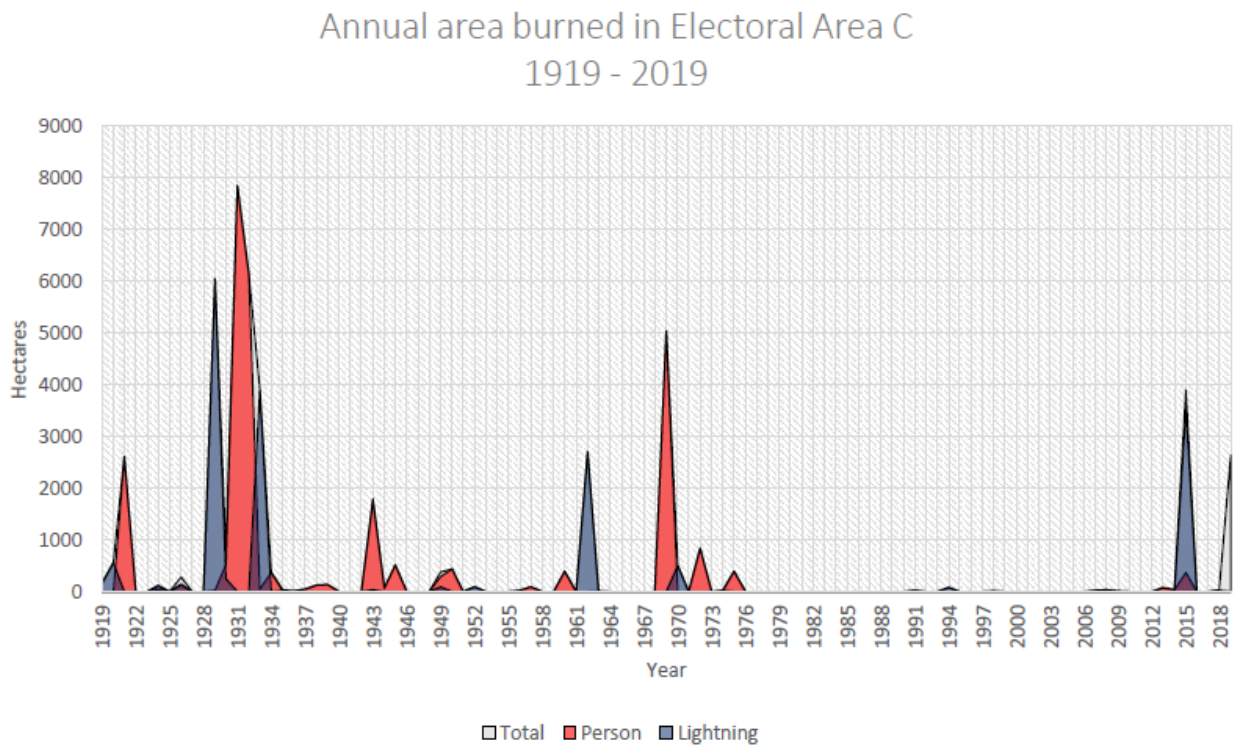

Figure 18 Annual area burned within the RDOS Electoral Area C from 1919.

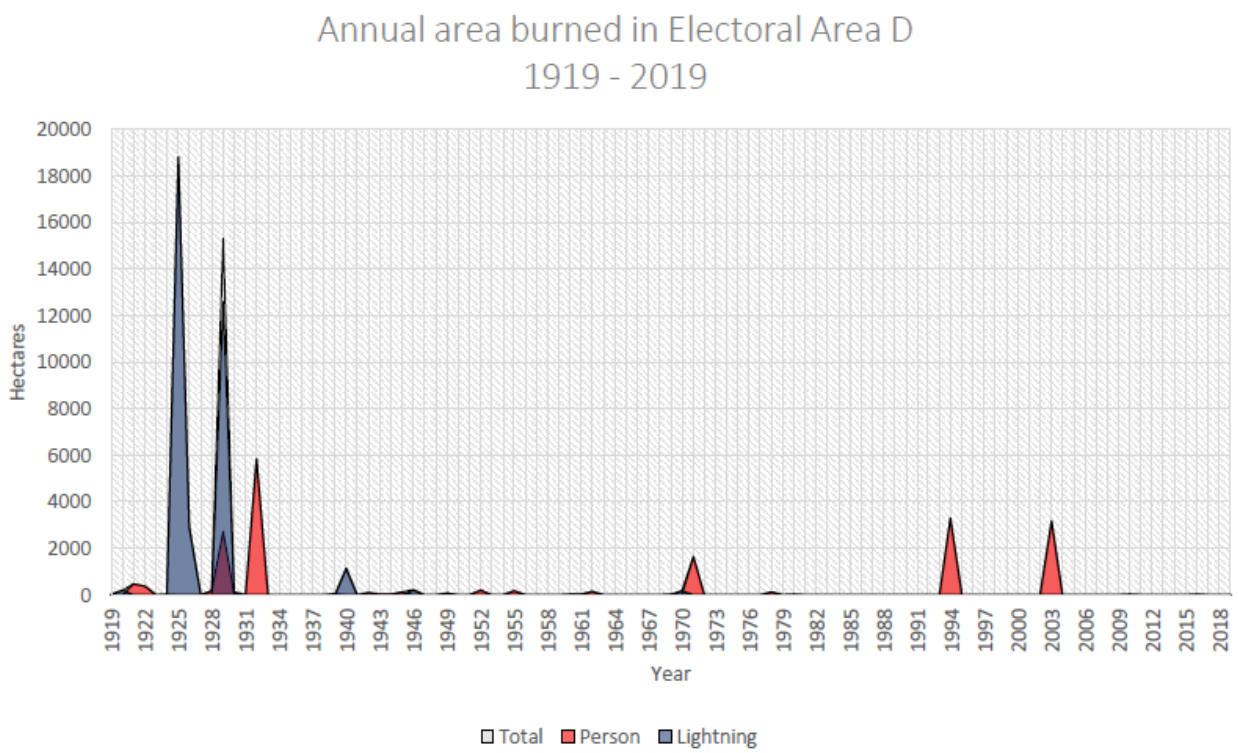

Figure 19 Annual area burned within the RDOS Electoral Area D from 1919.

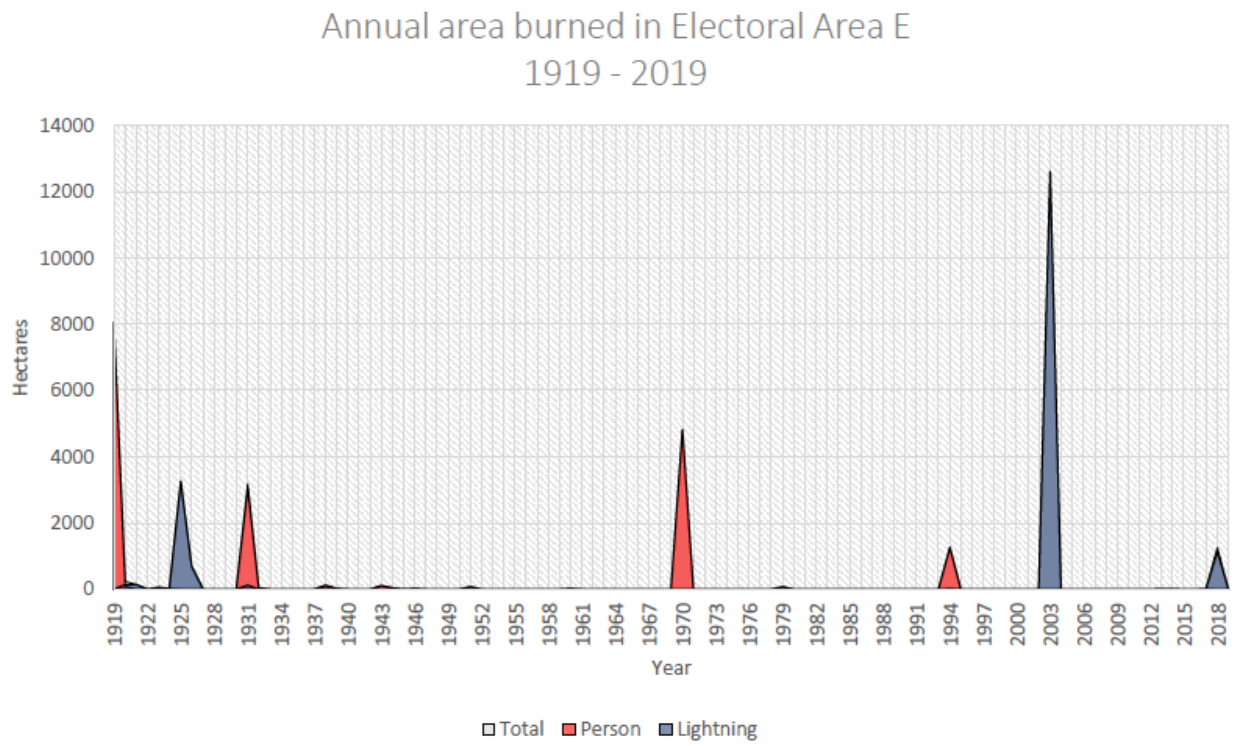

Figure 20 Annual area burned within the RDOS Electoral Area E from 1919.

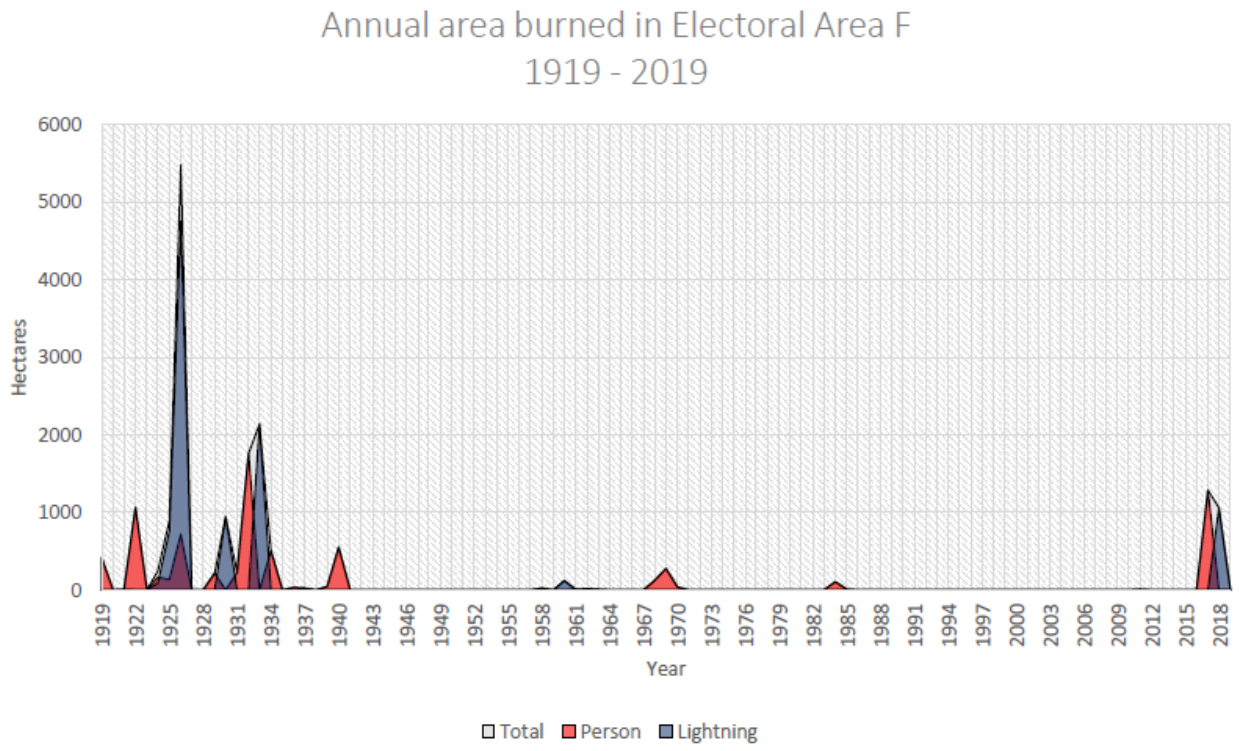

Figure 21 Annual area burned within the RDOS Electoral Area F from 1919.

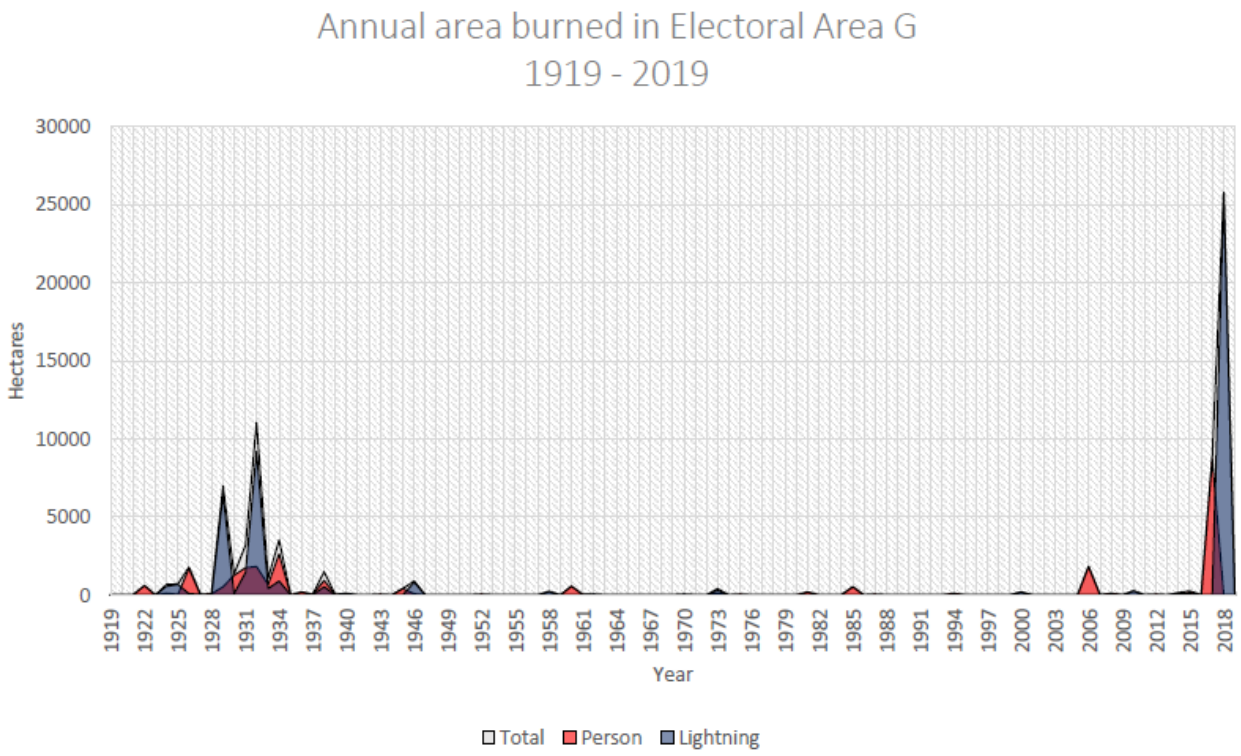

Figure 22 Annual area burned within the RDOS Electoral Area G from 1919.

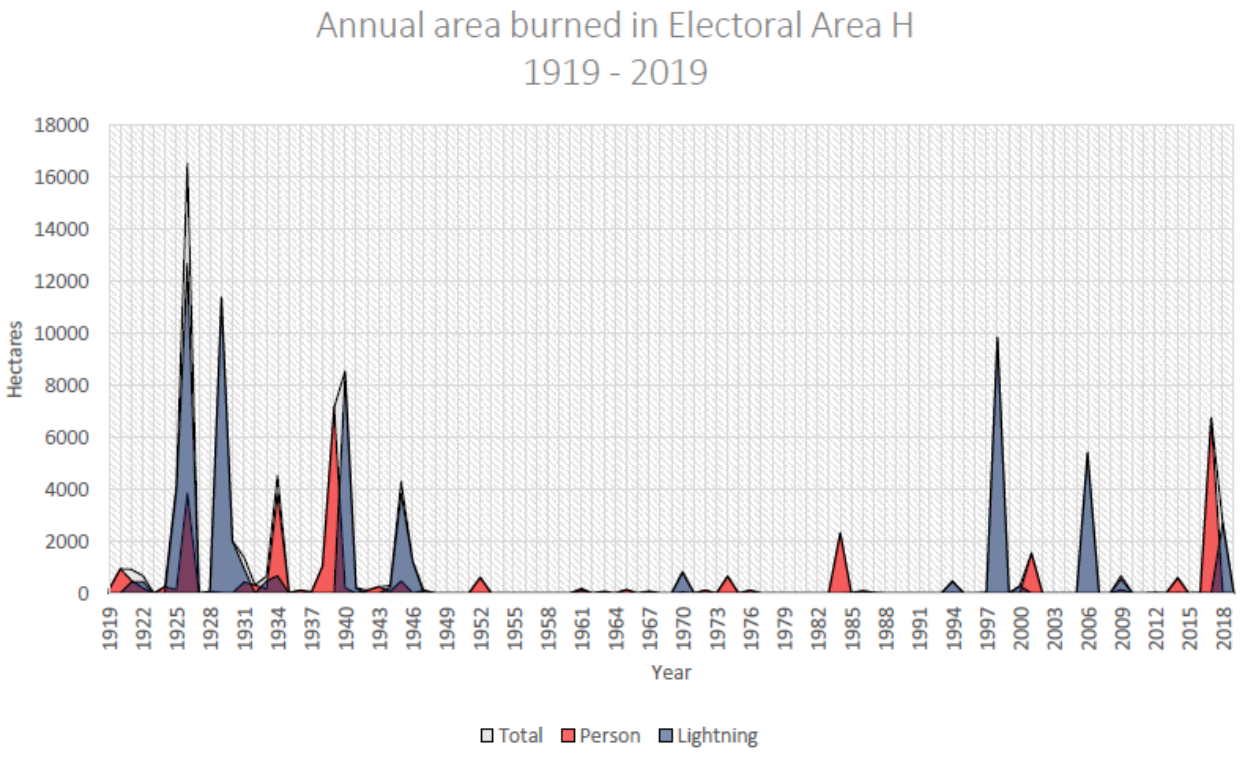

Figure 23 Annual area burned within the RDOS Electoral Area H from 1919.

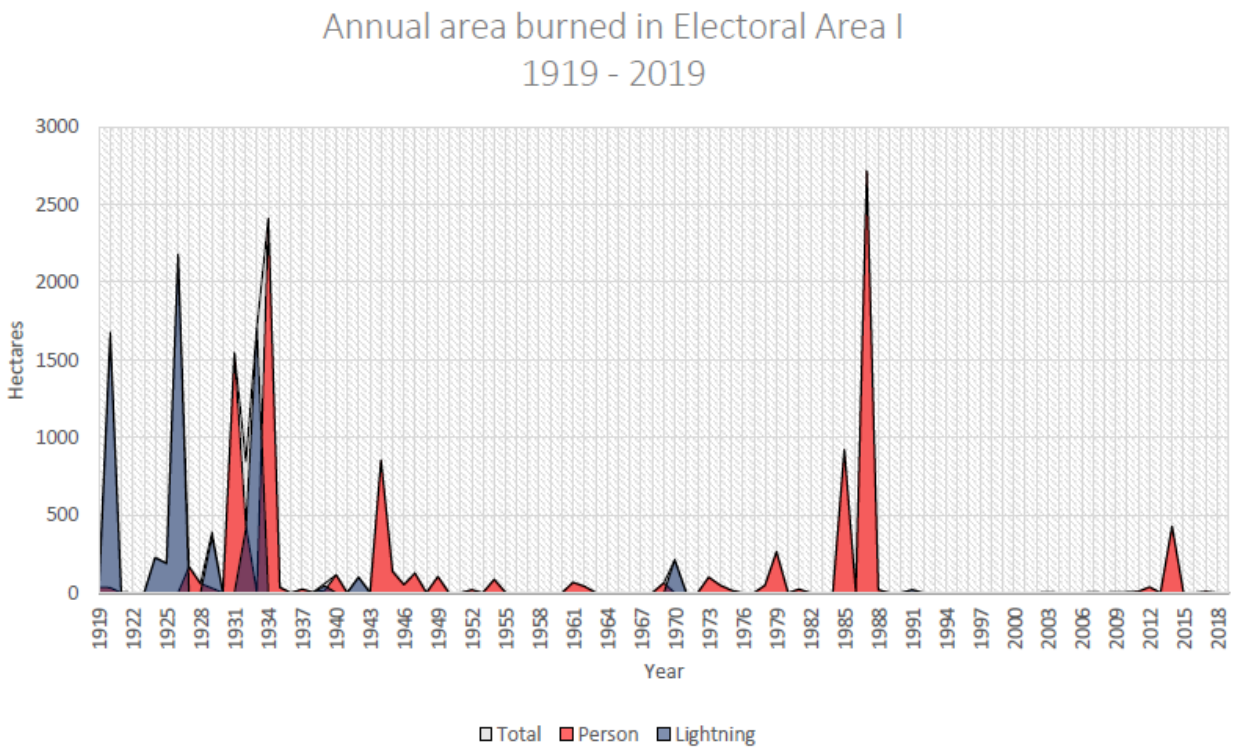

Figure 24 Annual area burned within the RDOS Electoral Area I from 1919.

For interest's sake, the entire fire history dataset for British Columbia has been summarized to help provide additional context to current wildfire issues (Figures 14 and 15). Across the province, the occurrence of person-caused wildfires has displayed a steady decline since the 1970s. Curiously though, lightning fires show a nearly opposite increasing trend. Provincially, this highlights both good and bad news: humans are starting fewer unwanted wildfires, but lightning fires seem to be increasing. The former trend can be encouraged through targeted prevention campaigns and land use practices, while the latter is completely outside our control.

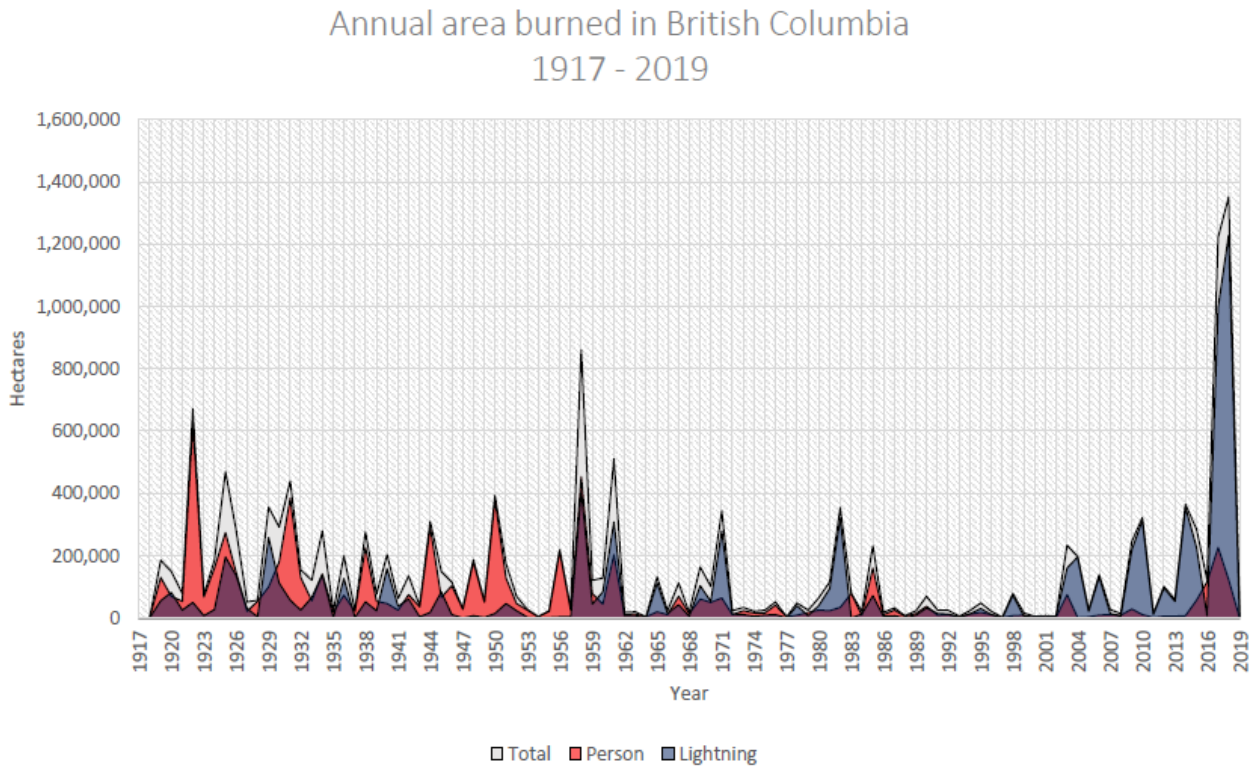

Figure 25 Annual area burned within British Columbia since 1917.

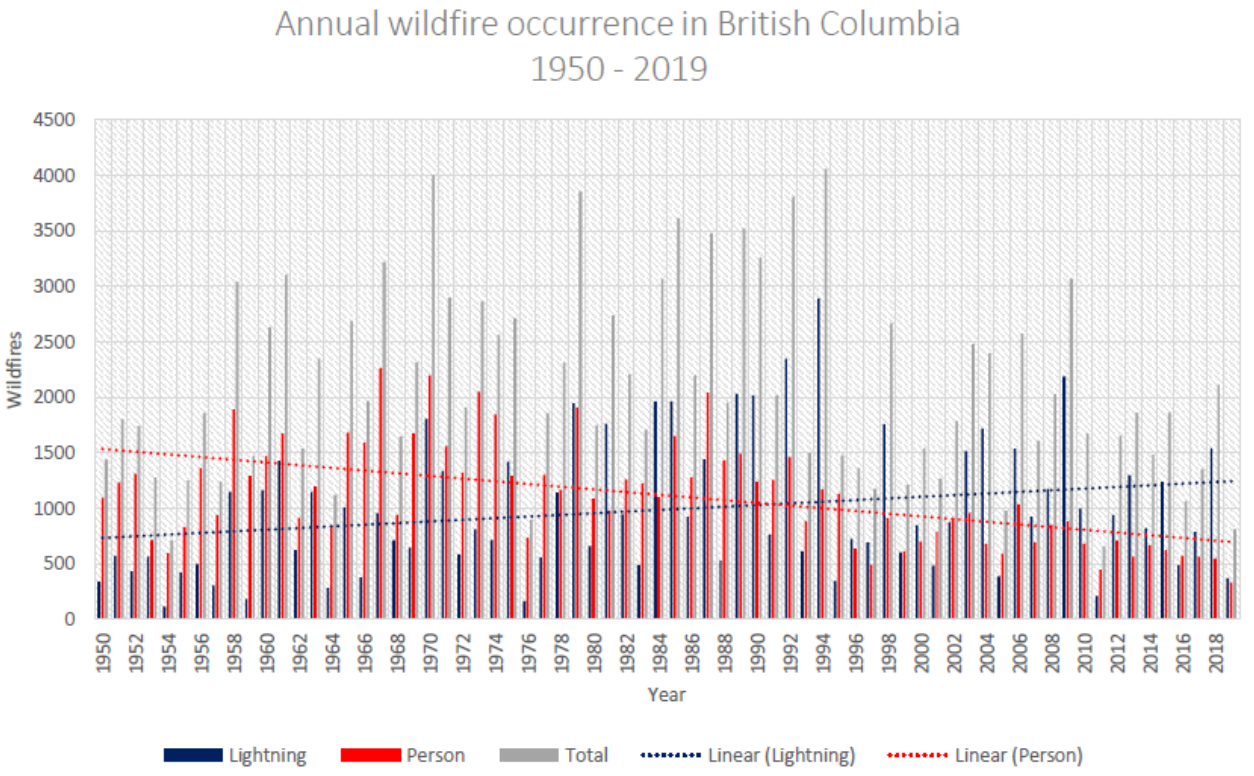

Figure 26 Annual wildfire occurrence in British Columbia from 1950 to 2019.

4.3 Local Wildfire Threat Assessment

The process to assess wildfire threat for the CWPP update followed the 2012 WUI Wildfire Threat Assessment guide methodology developed by Morrow et al. (2013). Normally, plot locations are selected through GIS analysis and fire behaviour modeling of the provincial fuel type layer. Specifically, the methodology seeks municipal or crown land polygons with a modelled fire behaviour rating of Moderate or higher that are within 100-m of a structure in the WUI. This methodology serves to identify the highest priority areas for field assessment. All told, 100 field threat assessments were conducted throughout the RDOS to inform the CWPP update.

The outputs from the local wildfire threat assessment are two threat classifications: Fire Behaviour Threat Class and WUI Threat Class. An area summary of both classifications is provided in Table 11.

Table 11 Summary of Fire Behaviour Threat Class and WUI Threat Class by area within RDOS.

Fire Behaviour Threat Classification

Class	Area (ha)	% of total area
Extreme	289,461	28%
High	331,134	32%
Moderate	129,482	13%
Low	117,660	11%
Very Low*	38,857	4%
No Data**	128,305	12%
	1,034,899	100%

WUI Threat Classification

Class	Area (ha)	% of total area
Extreme	505	0.05%
High	13,293	1%
Moderate	114,047	11%
Low	492,750	48%
N/A^	285,999	28%
No Data**	128,305	12%
	1,034,899	100%

* Very Low is lakes and other bodies of water
^ N/A is when the Fire Behaviour Threat Class is < High
** Areas of "No Data" are private land

4.4 Summary of Recommendations

Recommendation	Responsibility/Funding Source	Next Steps
• The RDOS would benefit from BCWS re-establishing the Chain Lake and Stemwinder fire weather stations. Benefits would include: o Improved fire weather information by reducing the blind spots that exist at Chain Lake and Stemwinder o Improved situational awareness for RDOS when making public safety decisions	BCWS	Initiate discussions with BCWS to investigate the willingness and feasibility of re-establishing the Chain Lake and Stemwinder fire weather stations.

5 Risk Management and Mitigation Factors

When considering the risk of wildland urban interface fires the issue can be viewed in terms of the probable frequency of a fire occurring, and the probable magnitude of the resulting losses. Wildfire occurrence directly relates to fire cause and is the focus of fire prevention planning and education, which is a fundamental element of wildfire management. As discussed in 4.2.4 fire cause in the AOI is attributed predominantly towards people. This fact illustrates the importance of an all-encompassing approach to managing wildland urban interface fire threats: although prevention programs can reduce the occurrence of person-caused fires, we will never be able to completely eliminate the probability of a wildfire occurring, so we also need to attempt to reduce the magnitude of each occurrence and it's associated probable future losses.

5.1 Fuel Management

Managing wildland fuels is one aspect of reducing the wildfire risk to communities in the wildland urban interface. In the drier low-elevation portions of the AOI the predominant fuel type in the interface is C7 Ponderosa Pine Douglas-fir. This fuel type, exemplified in the Interior Douglas-fir and Ponderosa Pine biogeoclimatic zones, is particularly well-suited to certain fuel management treatments, owing to its typical fire-maintained structure of well-spaced and pruned fire adapted conifer overstory (Figure 27).

Figure 27 Example of a fire-maintained plant community in West Kelowna. This area was burned by wildfire the previous year. Note the lower branches of the two Ponderosa pines in the foreground that have been scorched and will eventually fall off, effectively self-pruning the trees.

A variety of treatment methods are available for this particular fuel type, depending on treatment intensity, treatment timing, site sensitivity and public support, among other factors. Treatments in the C7 have traditionally been carried out by hand crews, whereby thinning and pruning have been undertaken with a variety of tools and techniques, including power saws, brush saws, pole-pruners etc. (e.g. Figure 28). Debris disposal is typically carried out either through pile and burn, chipping or hauling off-site. These types of hand treatments can be labour intensive, depending on stand density, surface fuel loading and terrain limitations. Hand

treatments are well suited to sites with thin and sensitive soils that would be otherwise degraded through ground-based equipment.

Figure 28 A fuel treatment was carried out on this site near Faulder in 2013. The treatment included thinning, pruning and slash disposal by pile burning.

Fuel treatments can also be carried out with mechanized equipment, such as feller bunchers and various types of mulchers. Conventional timber harvesting is also a viable form of fuel management in certain timber types, with the added benefit of at least partial recovery of costs through log utilization. The use of machinery enables the land manager to realize higher production rates compared to hand crew treatments alone. Site sensitivities are a significant factor when considering the use of mechanized methods – thin soils, common to lower elevation hot/dry sites can be significantly degraded if treatments aren't designed and carried out professionally.

Regardless of the method for reducing fuel loading on any particular forested site, surface fuels must be considered and attended to. During hand falling/bucking or mechanical harvesting, processing and yarding, surface fine fuel loading can increase with disturbance. In many cases, particularly in Ponderosa pine and interior Douglas-fir stands, the use of low-intensity prescribed fire can be an effective means of both reducing surface fine fuel loads and realizing beneficial ecological fire effects.

Fuel management treatments, particularly on NDT4 sites, should not be viewed as one-time actions. Rather, fuel treatments require periodic maintenance entries to maintain the integrity and purpose of the treatment area. In the absence of maintenance, or periodic low-intensity fire, treated NDT4 sites will trend back towards pre-treatment structure and conditions.

Fuel breaks on Crown or municipal land immediately adjacent to private land and in close proximity to the wildland urban interface and/or intermix areas, are termed interface fuel breaks. Interface fuel breaks are designed to modify fire behaviour, create fire suppression options and a safe place from which to anchor crews and tactics, and improve suppression outcomes. The dimensions of interface fuel breaks are dependant on the forest/fuel type and associated fire behaviour, but generally this type of fuel break will occupy, at minimum, the WUI 100 zone. The design of an interface fuel break should incorporate existing natural features, where they exist, that offer a similar modification or impediment to fire behaviour. These can be areas of low fuel loading, no fuel loading or a fuel type with less potential fire behaviour.

Fuel breaks created through stand modification are not intended to be impenetrable barriers to fire spread; rather they are intended to modify and decrease fire behaviour. Similarly, the presence of an interface fuel break alone does not ensure the survivability of adjacent structures, especially if those properties are not FireSmart. The combination of a well designed and maintained interface fuel break and adjacent private property and structures that are FireSmart, is a proven method of achieving real risk reduction.

Fuel breaks located beyond interface fuel breaks (i.e. beyond the WUI 100 zone) are termed primary fuel breaks. The location of primary fuel breaks is contingent on land ownership (Crown vs. private), existing natural and man-made features, fuel types, and prevailing wind patterns. As with interface fuel breaks, primary fuel breaks are intended to modify fire behaviour and create fire suppression options that reduce the risk of high intensity wildfire reaching a community or other built-up areas.

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 need to have sufficient width and fuel modification to minimize horizontal and vertical fuel continuity to effectively reduce the head fire intensity as a wildfire enters into the fuel break.

As with interface fuel breaks, primary fuel breaks should not be viewed as impenetrable barriers to fire spread. The potential for ember transport and spot fires on the community side of any fuel break is a very real concern and may negate the effectiveness of any fuel break if not designed and treated in a manner that attempts to reduce this risk.

The responsibility to treat hazardous wildland fuel is dependent on the ownership class of the land in question. Regional districts are typically comprised of a majority of crown land and private land, with very little actual property under direct ownership and responsibility of the regional district. In this sense, regional districts are more reliant on the provincial government than other forms of local government to achieve wildfire risk reduction for the benefit of the residents that they serve. This is the case for RDOS, where 44 areas have been identified through the WUI Wildfire Threat Assessment for this CWPP, of which four areas totalling 32.4 ha are predominantly mapped as *municipal* ownership class. The remaining 40 areas (2,894.4 ha) are crown land (including some parks/protected area) that is either directly adjacent to the WUI or has the ability to carry fire into the WUI. Recommended treatment areas that would be the responsibility of RDOS are listed in Table 12 , while all recommended treatment areas are summarized in Table 13.

Table 12 Recommended treatment areas that would fall under the responsibility of the RDOS.

Electoral Area	Unit_ID	Area ha	Wildfire behaviour threat score	Wildfire behaviour threat class	WUI threat score	WUI threat class	Total threat score	Feature Type	Geographic	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6	Comment	Primary ownership class (minority component)	Funding source
E	EA_E_001	2.4	143	High	53	Extreme	196	Fuel break	Naramata	TFB	LBD	PRU	PIL	BP	PB	Treatment areas limited by slope and access	Municipal	CRI
E	EA_E_002	11.2	131	High	53	Extreme	184	Fuel break	Naramata	TFB	LBD	PRU	PIL	BP	PB	Treatment areas limited by slope and access	Municipal	CRI
I	EA_I_007	17.5	87	Moderate	26	Moderate	113	Fuel break	Kaleden - Cypress	PB							Municipal	CRI
I	EA_I_006	1.3	79	Moderate	26	Moderate	105	Fuel break	Kaleden - Lakehill	TFB	LBD	PRU	PIL	BP	PB	Partial overlap with existing community-led treatment.	Municipal	CRI
Total		32.4																

Code	Activity / Action
TFB	Thin from below
LBD	Limb and buck existing downed stems
PRU	Prune
PIL	Pile treatment debris
BP	Burn debris piles
PB	Prescribed burn

Table 13 Treatment area recommendations.

Electoral Area	Unit_ID	Area ha	Wildfire behaviour threat score	Wildfire behaviour threat class	WUI threat score	WUI threat class	Total threat score	Feature Type	Geographic	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6	Comment	Primary ownership class (minority component)	Funding source
E	EA_E_001	2.4	143	High	53	Extreme	196	Fuel break	Naramata	TFB	LBD	PRU	PIL	BP	PB	Treatment areas limited by slope and access	Municipal	CRI
I	EA_I_005	28.7	146	High	47	Extreme	193	Fuel break	White Lake Road - West	TFB	LBD	PRU	PIL	BP	PB	Sole access/egress; multiple switchbacks; steep road gradient; potential for fire entrapment.	Crown	CLWRR
H	EA_H_009	20.5	159	Extreme	33	High	192	Fuel break	Allison Lake	TFB	LBD	PRU	PIL	BP			Crown (BC Parks)	CLWRR
H	EA_H_002	403.7	145	High	40	Extreme	185	Fuel break	West China Ridge	TFB	LBD	PRU	PIL	BP	PB	Multiple strata. Commercial utilization opportunities.	Crown	CLWRR
H	EA_H_003	297.9	155	Extreme	30	High	185	Fuel break	Black Mine Road	TFB	LBD	PRU	PIL	BP	PB	Multiple strata. Commercial utilization opportunities.	Crown	CLWRR
E	EA_E_002	11.2	131	High	53	Extreme	184	Fuel break	Naramata	TFB	LBD	PRU	PIL	BP	PB	Treatment areas limited by slope and access	Municipal	CRI
H	EA_H_001	1,052.1	157	Extreme	27	High	184	Fuel break	August Lake	TFB	LBD	PRU	PIL	BP	PB	Multiple strata	Crown	CLWRR
H	EA_H_008	12.6	161	Extreme	23	Moderate	184	Fuel break	Missezula Lake - East	TFB	LBD	PRU	PIL	BP			Crown	CLWRR
I	EA_I_004	28.1	135	High	43	Extreme	178	Fuel break	St. Andrews / Catamount Place	TFB	LBD	PRU	PIL	BP	PB	Partial overlap with an existing CWPP treatment recommendation (SWPI-1397) - requires maintenance and treatment expansion.	Crown	CLWRR
H	EA_H_021	21.4	141	High	34	High	175	Fuel break	Coalmont - East	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
I	EA_I_001	6.6	138	High	37	High	175	Fuel break	Green Lake - North	TFB	LBD	PRU	PIL	BP	PB	Primary objective to mitigate first-order fire effects to Green Lake Rd switchbacks and evac route integrity.	Crown	CLWRR
H	EA_H_013	4.6	128	High	43	Extreme	171	Fuel break	Osprey Lake - West	TFB	LBD	PRU	PIL	BP		Multiple strata. Commercial utilization opportunities.	Crown	CLWRR
I	EA_I_009	33.2	129	High	40	Extreme	169	Fuel break	Apex Mountain - Village	TFB	LBD	PRU	PIL	BP		Prescription in development for FLNRORD Mountain Resorts Branch	Crown	CLWRR
H	EA_H_010	2.4	134	High	33	High	167	Fuel break	Allison Lake	TFB	LBD	PRU	PIL	BP			Crown	CLWRR
H	EA_H_014	15.0	124	High	43	Extreme	167	Fuel break	Osprey Lake - East	TFB	LBD	PRU	PIL	BP			Crown	CLWRR
C	EA_C_002	8.5	141	High	25	Moderate	166	Fuel break	Willowbrook - North	TFB	LBD	PRU	PIL	BP	PB		Crown (BC Parks)	CLWRR

Electoral Area	Unit_ID	Area ha	Wildfire behaviour threat score	Wildfire behaviour threat class	WUI threat score	WUI threat class	Total threat score	Feature Type	Geographic	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6	Comment	Primary ownership class (minority component)	Funding source
E	EA_E_003	4.8	131	High	35	Extreme	166	Fuel break	Naramata	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
H	EA_H_023	101.8	121	High	45	Extreme	166	Fuel break	Martin Lake / Lower Iron Mtn. Road	TFB	LBD	PRU	PIL	BP	PB	Multiple strata.	Crown	CLWRR
E	EA_E_004	28.5	130	High	34	High	164	Fuel break	Lower Chute Lake Road	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
H	EA_H_007	38.4	136	High	28	High	164	Fuel break	Missezula Lake - West	TFB	LBD	PRU	PIL	BP		Treatment areas limited by slope and access	Crown	CLWRR
H	EA_H_016	48.7	119	High	43	Extreme	162	Fuel break	Tulameen - West	TFB	LBD	PRU	PIL	BP	PB	Multiple strata. Commercial utilization opportunities.	Crown	CLWRR
H	EA_H_022	16.9	141	High	20	Moderate	161	Fuel break	Coalmont - East	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
H	EA_H_019	6.6	141	High	20	Moderate	161	Fuel break	Tulameen - East	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
H	EA_H_015	30.6	126	High	33	High	159	Fuel break	Bromley Rock	TFB	LBD	PRU	PIL	BP	PB	Partial overlap with Prov. Park	Crown (BC Parks)	CLWRR
F	EA_F_001	43.4	131	High	27	High	158	Fuel break	Bathville / Kereluk Road	TFB	LBD	PRU	PIL	BP	PB	Overlaps with an existing CWPP treatment recommendation (SWPI1763)	Crown	CLWRR
F	EA_F_002	70.0	128	High	30	High	158	Fuel break	Faulder - West	TFB	LBD	PRU	PIL	BP	PB	Overlaps with an existing CWPP treatment recommendation (SWPI1763)	Crown	CLWRR
F	EA_F_003	43.3	125	High	30	High	155	Fuel break	Faulder - East	TFB	LBD	PRU	PIL	BP	PB	Overlaps with an existing CWPP treatment recommendation (SWPI-1763)	Crown	CLWRR
G	EA_G_001	2.4	117	High	33	High	150	Fuel break	Hedley - West	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
A	EA_A_001	20.5	101	High	48	Extreme	149	Fuel break	Kilpoola	TFB	LBD	PRU	PIL	BP	PB		BC Parks	CLWRR
I	EA_I_003	137.6	118	High	30	High	148	Fuel break	St. Andrews - North	TFB	LBD	PRU	PIL	BP	PB	Partial overlap with an existing CWPP treatment recommendation (SWPI-1397) - requires maintenance and treatment expansion.	Crown	CLWRR
E	EA_E_006	23.8	123	High	23	Moderate	146	Fuel break	Grayback Road 0km	PB						Area under prescription and approved burn plan	Crown	CLWRR
D	EA_D_001	26.8	106	High	37	High	143	Fuel break	Heritage Hills	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR

Electoral Area	Unit_ID	Area ha	Wildfire behaviour threat score	Wildfire behaviour threat class	WUI threat score	WUI threat class	Total threat score	Feature Type	Geographic	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6	Comment	Primary ownership class (minority component)	Funding source
H	EA_H_012	8.2	111	High	30	High	141	Fuel break	Chain Lake	TFB	LBD	PRU	PIL	BP			Crown	CLWRR
H	EA_H_004	52.3	97	High	42	Extreme	139	Fuel break	East Gate - West	TFB	LBD	PRU	PIL	BP	PB	Multiple strata. Commercial utilization opportunities.	Crown (BC Parks)	CLWRR
E	EA_E_005	129.3	108	High	28	High	136	Fuel break	Naramata Bench KVR	TFB	PIL	BP	PB				Crown	CLWRR
H	EA_H_005	21.4	103	High	33	High	136	Fuel break	East Gate - West	TFB	LBD	PRU	PIL	BP	PB	Multiple strata. Commercial utilization opportunities.	Crown	CLWRR
E	EA_E_007	59.4	99	High	34	High	133	Fuel break	Lower Chute Lake Road / Glenfir	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
G	EA_G_002	5.7	100	High	33	High	133	Fuel break	Hedley - East	TFB	LBD	PRU	PIL	BP	PB	Partial overlap with historical treatment (unknown funding)	Crown	CLWRR
H	EA_H_011	22.1	112	High	20	Moderate	132	Fuel break	Hayes Creek	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
H	EA_H_020	2.9	86	Moderate	33	High	119	Fuel break	Tulameen - South	TFB	LBD	PRU	PIL	BP	PB		Crown	CLWRR
I	EA_I_007	17.5	87	Moderate	26	Moderate	113	Fuel break	Kaleden - Cypress	PB							Municipal	CRI
H	EA_H_006	8.0	94	Moderate	18	Moderate	112	Fuel break	East Gate - East	TFB	LBD	PRU	PIL	BP	PB	Multiple strata. Commercial utilization opportunities.	Crown	CLWRR
I	EA_I_008	6.1	85	Moderate	26	Moderate	111	Fuel break	Kaleden - KVR	PB						Challenging treatment area due to private land mid-slope above treatment area. Small-scale selective burning may only be possible.	Crown	CLWRR
I	EA_I_006	1.3	79	Moderate	26	Moderate	105	Fuel break	Kaleden - Lakehill	TFB	LBD	PRU	PIL	BP	PB	Partial overlap with effective community-led treatment.	Municipal	CRI
		2,926.7																

Code	Activity / Action
TFB	Thin from below
LBD	Limb and buck existing downed stems
PRU	Prune
PIL	Pile treatment debris
BP	Burn debris piles
PB	Prescribed burn

5.2 FireSmart Planning and Activities

The FireSmart Canada program is administered by Partners in Protection, a national non-profit association comprised of national, provincial and local government agencies with fire protection mandates. Modelled after the FireWise Communities USA program in the United States, FireSmart Canada has developed a comprehensive planning and assessment process to mitigate wildfire hazards to existing communities, as well as guide new development. Although the FireSmart program is primarily focused towards residential homes, the principles have been adapted for application in mixed-use areas, industrial activities and elsewhere. For this reason, although home or house are the terms most often used when describing FireSmart principles, structure or building are equally appropriate and more broadly applicable.

5.2.1 FireSmart Goals and Objectives

The FireSmart program seeks to strike a reasonable balance between the aesthetic values of living in WUI areas with the need to make communities more resilient to the effects of wildfire. At the core of the FireSmart program is the relationship between a home and the surrounding natural areas and whether this relationship can result in the transfer of fire between the two. Hazards are assessed and mitigated by giving priority to the structure and immediate surroundings and then working progressively outwards. This is accomplished through the establishment of three zones around a structure:

- Priority Zone 1a: The area within 1.5m of a building
- Priority Zone 1: The area within 10 m of a building
- Priority Zone 2: The area 10-30 m from a building
- Priority Zone 3: The area 30-100 m from a building

On sites with relatively higher building densities, multiple sets of priority zones invariably overlap. One building's Zone 2 may be an adjacent building's Zone 1 and so forth. This characteristic is common in all but the most rural of WUI settings and speaks to the shared nature of wildfire hazard and collective resilience.

The general goal of FireSmart is to encourage private landowners to adopt FireSmart practices to reduce the fuel hazard and implement other measure to minimize damages to assets on their property from wildfire. These include:

- 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 fuels adjacent to structures to reduce the probability of ignition from radiant heat, direct flame contact, and/or ember transport.
- Implement measures to structures and assets that reduce the probability of ignition and loss.

Research and post-fire reviews have shown that when values have been constructed, retrofitted or treated in accordance with FireSmart principles, they stand a greater chance of survival compared to those that haven't (Westhaver 2017) (Partners in Protection 2003). The spatial scale that determines home ignitions corresponds more to the specific site and characteristics of homes and property than to landscape scale wildfire management and fuel modification strategies (J. D. Cohen 2004). In order to truly reduce the threat of homes and other values being destroyed in wildland urban interface fire disasters, homeowners and governments alike must take deliberate and concerted steps to properly assess and mitigate hazards.

5.2.2 Key Aspects of FireSmart for Local Governments

The FireSmart program is wholly dependent on interest and participation from residents who live in fire prone environments. Obviously, while local governments can't force residents to take an active interest in any particular cause or issue, they can conduct public education and awareness campaigns and support FireSmart projects, with the goal of building a critical mass of motivated residents who are committed to reducing the ignitability of their homes.

The challenge that local governments continue to face is how to deal with private landowners who are either unable or unwilling to mitigate fuel hazards on their property. Publicly funded programs such as FireSmart are not permitted to be used directly for work on private property, and there is little recourse for local governments to compel private landowners to undertake mitigation actions. Even if most homes in a residential area undertake meaningful FireSmart actions, when unmitigated private properties are interspersed among them, the overall threat to mitigated property remains, due to the threat of structure to structure ignition and propagation.

Since the previous RDOS CWPP, increased Provincial focus has been placed on the FireSmart program, and the RDOS has made progress with completing FireSmart projects, as summarized in Section 2.4. One way to maintain this momentum is to improve the quality of FireSmart public events through the acquisition of a dedicated and highly visible self-

contained FireSmart event trailer. Such a trailer would provide a form of FireSmart advertising and could be stocked with public information displays, as well as a selection of tools and personal protective equipment (e.g. gloves and eye protection) to facilitate neighbourhood brush clearing events. A Local FireSmart Representative could make use of the trailer and its contents to provide public education and outreach, as well as onsite advice and suggestions on private property hazard mitigation actions during a FireSmart event. Furthermore, the trailer could be paired with an as-needed rental chipper (with qualified operator) or disposal bin for debris disposal to provide a total FireSmart event solution. Other suggested FireSmart activities that have been successful with other local governments are presented in Table 14.

Table 14 FireSmart strategies for communities.

FireSmart Theme	Suggested Activities
Communication, Education & Partnerships	• Host a FireSmart day • Use local government newsletters and social media • Undertake FireSmart Local Representative or Community Champion training • Continue to pursue CRI funding for FireSmart projects • Form a community wide FireSmart committee • Encourage homeowners and/or neighborhoods to undertake FireSmart site assessments and area assessments
Vegetation management	• Develop FireSmart demonstration areas in public spaces, such as parks and municipal facilities • Strengthen landscaping requirements in zoning and development permits to require fire resistive landscaping and replacement of legacy high-flammability plants. • Facilitate treatment debris disposal for landowners
Planning & Development	• Strengthen policies and practices for FireSmart construction and maintenance of public buildings • Continue to support the enactment of Wildfire Development Permit Areas in order to require FireSmart exterior finishing, landscaping and professional assessments and recommendations

5.2.3 Priority Areas Within the Area of Interest

The RDOS has been active with pursuing FireSmart projects for neighbourhoods for a number of years, with several areas receiving FireSmart Canada Community Recognition. Based on the wildfire threat assessments, the following neighbourhood areas are suggested for FireSmart projects in Table 15:

Table 15 Summary of neighbourhoods and communities recommended for FireSmart Community Recognition projects.

Area ID	Wildfire Risk Rating (E/H/M/L)	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities Suggested timeline: 5 years (two projects per year)
White Lake Road - West	E	N	N	Support a Community Recognition project by: • Seeking CRI funding • Support the formation of a neighbourhood FireSmart board • Support the development of a Community Assessment Report • Provide annual support to the FireSmart board to hold a neighbourhood FireSmart event each year.
Alison Lake	H	N	N	
Coalmont	H	N	N	
Osprey Lake	E	N	N	
Kilpoola	E	N	N	
Chain Lake	H	N	N	
East Gate	E	N	N	
Willowbrook	M	N	N	
Anarchist Mountain	E	N	N	
Hayes Creek	M	N	N	

5.3 Community Communications and Education

There is immense value in sharing the CWPP with the public and with adjacent First Nations, local governments, utility providers, industry, and relevant NGOs. Doing so helps to raise awareness of wildfire issues in the region and may open the door to further collaboration amongst partners and stakeholders. To this end, the CWPP and the associated maps should be made available to the public via the RDOS website, social media and through public FireSmart meetings and presentations.

The following community engagement strategies would be of benefit to the RDOS and its residents in furthering wildland urban interface fire awareness and education:

- Establish a community wildfire safety page on The RDOS webpage, that includes:
    - the current CWPP;
    - completed FireSmart Community Assessment Reports;

    - information for residents on how to conduct their own FireSmart Structure and Site Hazard Assessment Forms, and steps they can take to lower their hazard scores;
- Host wildfire or FireSmart public education workshops or information sessions prior to and during fire season

5.4 Other Prevention Measures

One additional concern that the RDOS has raised relates to vegetative fuel along highways within the regional district. Provincial highways are under the jurisdiction of the Ministry of Transportation and Infrastructure (MoTI) and are maintained by contractors within designated service areas. The RDOS overlaps with four service areas: Fraser Valley, Kootenay Boundary, Nicola, and South Okanagan. The current contracts for maintenance were entered into in 2018-2019 and are in place until 2028-2029 (specific dates vary by service area). The service agreements define the frequency and/or quantity of service, and associated performance measures. The previous service agreements for highway maintenance were entered into in 2003-2004.

There were some important changes related to vegetation control along Provincial highways with the turnover from the 2003-2004 service agreements to the 2018-2019 agreements. Specific to roadside mowing (from shoulder tops and to a width of 1.8 m from the shoulder edge), the previous agreement specified mowing to occur when vegetation height exceeded 25 cm on Summer Maintenance Class 1-5 highways, to a maximum of two cuts per year. The current 2018-2019 service agreement has expanded the Summer Maintenance Class for mowing to include class 6 and 7 highways, and the two-cut maximum has been eliminated. The current performance measures are summarized as follows:

- Cut vegetation from shoulder tops and to a width of 1.8 m from the shoulder edge that exceeds 25 cm in height on Class 1 – 7 highways
- Cut vegetation that exceeds 15 cm in height at rest areas and other specified areas
- Cut vegetation that exceeds 10 cm in height on raised hard surfaced infrastructure

The proportion of Summer Maintenance Class highways in the RDOS are summarized by kilometer and service area in Table 16. The 2003-2004 vegetation control performance measures specified 1,019.3 km (53.9% of Provincial highways) in the RDOS to be mowed when shoulder vegetation (within 1.8 m from the shoulder edge) exceeded 25 cm, to a maximum of two cuttings. Under the 2018-2019 service agreement, an additional 736.5 km (38.9%) of

Summer Maintenance Class 6 and 7 highways in the RDOS (and throughout the Province) were added to the vegetation control standards, with no maximum cuttings per year (the 25 cm vegetation height threshold and swath dimensions remain unchanged). This change has resulted in 1,755.8 km (92.8%) of Provincial highways in the RDOS being tied to the shoulder vegetation control performance standard.

It is important to note that there is no mention of wildland fuel hazard or risk of ignition in the current vegetation control performance measures[6]. This omission, in addition to the requirements of the Wildfire Regulation, whereby the maintenance of rights of way (including grass mowing) is defined as a *high-risk activity* and subject to certain restrictions (up to and including ceasing activity) during Fire Danger Class 3 -5, may result in roadside vegetative fuel hazards persisting through the fire season. Therefore, and in light of the concerns raised by the RDOS, it is recommended that the RDOS and MoTI work together to ensure that wildland fuel hazards along provincial highways in the RDOS are actively identified, monitored and mitigated prior to fire season in order to attempt to limit the potential for roadside wildfire ignitions. This could include developing a memorandum of understanding that stipulates as much and /or ensuring that future iterations of the highway service agreements specify roadside wildland fuel hazard mitigation in the vegetation control and brush removal standards.

Table 16 Proportion of Provincial highway summer maintenance classes within the RDOS. Among other things, summer maintenance class corresponds to shoulder mowing performance measures.

Summer Maintenance Class	Fraser Valley SA	Kootenay Boundary SA	Nicola SA	South Okanagan SA	Grand Totals (km)^	
1 - ADT* > 10,000	0.0	0.0	0.0	77.1	77.1	4.1%
2 - ADT 5,000 TO 10,000	70.4	0.0	83.9	258.1	412.5	21.8%
3 - ADT 1,000 TO 5,000	0.0	2.9	3.4	35.4	41.7	2.2%
4 - ADT 500 TO 1,000	8.4	0.0	0.0	54.4	62.8	3.3%
5 - ADT 100 TO 500	0.0	0.0	4.5	420.7	425.2	22.5%
6 - ADT 10 TO 100	4.0	2.0	7.0	643.0	655.9	34.7%
7 - ADT 0 TO 10	0.3	0.3	0.0	80.0	80.6	4.3%
8 - No Summer Maintenance	0.0	0.0	0.0	135.2	135.2	7.2%
Service Area Totals (km)^	83.1	5.2	98.8	1704.0	1891.1	100.0%
	4.4%	0.3%	5.2%	90.1%	100.0%	

** Average Daily Traffic*

^ Provincial highways within RDOS

[6] The 2003-2004 roadside vegetation control standard included "reduce possible fire hazards" in the maintenance objective.

5.5 Summary of Recommendations

Recommendation	Responsibility/Funding Source	Next Steps
Establish a Wildfire Development Permit Area	RDOS with UBCM funding support	• Establish a Wildfire Development Permit Area for the entire RDOS. As various Official Community Plans (OCPs) are amended or updated from time to time, ensure that requirements and guidelines complement the Wildfire Development Permit Area requirements. Progress to date: RFP concluded in May 2020 seeking proposals to update the OCP and develop a Wildfire DPA for Electoral Area A.
Conduct fuel hazard mitigation – regional district lands	RDOS with UBCM CRI funding support	• Over a 3-5 year period, apply for funding to prescribe and treat 32.4 ha of municipal ownership class lands summarized in Table 13.
Support fuel hazard mitigation – crown lands	FLNRORD with funding from the Crown Land Wildfire Risk Reduction (CLWRR) program	• Through the South Okanagan Similkameen Wildfire Prevention Working Group, support FLNRORD to develop prescriptions and undertake wildfire risk reduction treatments on 2,874 ha of crown land summarized in Table 13 that pose a hazard to residential property in RDOS.
Support fuel hazard mitigation – BC Parks	BC Parks	• Through the South Okanagan Similkameen Wildfire Prevention Working Group, support BC Parks to develop prescriptions and undertake wildfire risk reduction treatments on 20.5 ha of provincial park/protected area summarized in Table 13 that

		pose a hazard to residential property in RDOS.
Ensure that the current CWPP and related deliverables are readily accessible and shared with the public, First Nations, adjacent local governments, industry, and relevant NGOs.	RDOS; South Okanagan Similkameen Wildfire Prevention Working Group	• Post the CWPP and maps on the RDOS website and share across social media platforms • Share the CWPP and maps with partners and stakeholders. • Present and make available the CWPP and maps during public FireSmart meetings and presentations.
Develop a regional district wildfire risk reduction communications plan	RDOS with UBCM CRI funding support. Coordination with the South Okanagan Similkameen Wildfire Prevention Working Group.	• In support of the goals of the South Okanagan Similkameen Wildfire Prevention Working Group, develop an RDOS communications for wildfire risk reduction engagement with partners, stakeholders, and the public. The plan should include: o The ecological and cultural roles that fire has had on the regional landscape o The critical role that private landowners can play in the shared responsibility of wildfire risk reduction o The requirement for current information and guidance from official sources, with the understanding that links to some sites invariably change periodically • The requirement for current Fire Danger Class information for each of the BCWS fire weather stations that are representative to the RDOS.

Conduct FireSmart Community Recognition Projects	RDOS with UBCM CRI funding support	• Continue to support new FireSmart Community Recognition projects for RDOS neighbourhoods. A prioritized list of recommended areas can be found in Table 15
		  ○ Over a five-year period, plan on completing two (at minimum) community recognition projects per year
		• While recognizing that FireSmart Community Recognition projects are not intended to be one-time efforts, provide annual support to the existing FireSmart Boards in the RDOS and support the annual application for renewal of recognition
		• Substantial progress has been made, with the completion of FireSmart Community Assessment Reports for:
		  ○ Faulder
		  ○ Twin Lakes
		  ○ Kaleden
		  ○ Husula
		  ○ Heritage Hills
		  ○ Smethhurst/Arawana
		  ○ Missezula Lake
		  ○ St. Andrews

Acquire an enclosed trailer that can be branded with RDOS FireSmart graphics and stocked with public education materials, as well as hand tools and basic PPE (e.g. gloves and eye protection) to facilitate FireSmart events, including neighbourhood brush cleanup. Trailer should be paired with a rental chipper and/or disposal bins to	RDOS with UBCM funding support. Vendor/supplier sponsorship may help to off-set costs.	• Establish trailer design requirements (should be enclosed and locking), including interior modification to enable the secure storage and transportation of public education and basic hand tools. • Determine the RDOS and FireSmart branding requirements and secure permission from FireSmart

facilitate debris disposal (with qualified operator).		Canada for the use of their brand. • Purchase trailer, presentation materials, hand tools. • Establish a list of qualified vendors to supply a chipper with operator and/or disposal bin. Vendor sponsorship may help to off-set capital acquisition and operating costs.
Support fire use and prescribed fire in the region.	RDOS; South Okanagan Similkameen Wildfire Prevention Working Group.	• By way of the South Okanagan Similkameen Wildfire Prevention Working Group, support those agencies and First Nations that are managing natural fire use and prescribed fire by: o Amplifying public engagement that supports prescribed fire use
Establish a working relationship between RDOS and MoTI to address wildland fuel hazard concerns along Provincial highways in the RDOS.	RDOS; South Okanagan Similkameen Wildfire Prevention Working Group; MoTI.	• Develop a memorandum of understanding (or similar) to facilitate the ongoing and shared interest in wildland fuel management and roadside vegetation control, including: o A shared interest in identifying, monitoring and mitigating roadside wildland fuel hazards o Establishment of best practices related to roadside vegetation control in RDOS that attempts to limit the occurrence of hazardous wildland fuel during the fire season.

6 Wildfire Response Resources

The BC Wildfire Service, as a branch of the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD), has responsibility to respond to wildfires outside local fire protection areas and to provide assistance to local fire departments on wildfires within their fire protection area, when requested. Fire departments are responsible for their own costs incurred while responding to wildfires within their jurisdiction. Costs incurred by the BCWS to undertake firefighting assistance within a fire department protection area are borne by the Province. In situations where the BCWS requests a fire department to respond to a wildfire outside their fire protection area, the fire department is compensated according to the Inter-Agency Operational Procedures and Reimbursement Rates agreement (The Office of the Fire Commissioner, The Fire Chiefs Association of BC, BC Wildfire Service, 2017).

6.1 Local Government Firefighting Resources

Within the RDOS area, several fire departments and fire brigades are in place to service areas outside of municipal fire protection areas.

6.1.1 Fire Departments

The RDOS manages seven fire departments in the regional district. Each fire department is established under their own RDOS bylaw, while the operations of each department are enabled collectively under RDOS Bylaw No. 2857, 2019 (Regional District of Okanagan-Similkameen 2019).

6.1.1.1 Anarchist Mountain Volunteer Fire Department

The Anarchist Mountain Fire Department was established by RDOS Bylaw No. 2334 in 2005 (Regional District of Okanagan-Similkameen 2005). Authorized to provide the following services:

- Fire suppression
- Auto extrication
- Medical first responder
- Low angle rescue

6.1.1.2 Kaleden Volunteer Fire Department

The Kaleden Volunteer Fire Department was formed in 1972 and is established under RDOS Bylaw No. 1238. Authorized to provide the following services:

- Fire suppression
- Auto extrication
- Medical first responder
- Low angle rescue
- Medium angle rescue

6.1.1.3 Keremeos and District Volunteer Fire Department

The Keremeos and District Volunteer Fire Department was formed in 1940 and is established under RDOS Bylaw No. 2178. Authorized to provide the following services:

- Fire suppression
- Auto extrication
- Property fire inspections
- Low angle rescue
- Medium angle rescue
- Confined space rescue

6.1.1.4 Naramata Volunteer Fire Department

Naramata Volunteer Fire Rescue is established under RDOS Bylaw No. 1619. Authorized to provide the following services:

- Fire suppression
- Auto extrication
- Medical first responder
- Still water rescue
- Low angle rescue
- Marine rescue

6.1.1.5 Okanagan Falls Volunteer Fire Department

The Okanagan Falls Volunteer Fire Department is established under RDOS Bylaw No. 1310. Authorized to provide the following services:

- Fire suppression
- Auto extrication
- Medical first responder
- Property fire inspections

- Still water rescue
- Low angle rescue
- Marine rescue

6.1.1.6 Tulameen and District Volunteer Fire Department

The Tulameen and District Fire Department is established under RDOS Bylaw No. 1574. Authorized to provide the following services:

- Fire suppression
- Medical first responder

6.1.1.7 Willowbrook Volunteer Fire Department

The Willowbrook Volunteer Fire Department was formed in 1985 and is established under RDOS Bylaw No. 1388. Authorized to provide the following services:

- Fire suppression
- Medical first responder

6.1.2 Other Fire Departments in the RDOS Area

The following fire departments operate within the footprint of the RDOS but are not managed by the RDOS or enabled through RDOS bylaw. These include fire departments of municipalities, improvement district and several fire brigades and societies.

6.1.2.1 Municipal or Improvement District

- Hedley Volunteer Fire Department
- Oliver Fire Department
- Osoyoos Fire Department
- Penticton Fire Department
- Penticton Indian Band Fire Department
- Princeton Volunteer Fire Department
- Summerland Fire Department

6.1.2.2 Societies and Brigades

- Apex Fire Brigade Society
- Eastgate Fire Protection Society
- Erris Volunteer Fire Association
- Hayes Creek Volunteer Firefighters Association

6.1.3 Water Availability for Wildfire Suppression

Suppression strategies that hinge on the availability of water are inherently limited to direct attack or supplying sprinkler systems, both of which may not be possible given higher fireline intensities or within the initial attack timeframe. The nature of rural fire protection also often requires the bulk transportation of suppression water by shuttling with water tenders. Where sustained attack is required involving long turnaround cycles for water tenders, additional tenders via mutual aid is often necessary.

Where water availability is limited, additional tactics are often required to achieve suppression objectives, such as indirect or parallel attack using controlled ignition to attempt to gain control. Where access and/or water availability are limited, often aircraft may be the only other suitable option for direct attack. The use of air tankers dropping long-term retardant, or amphibious aircraft dropping suppressant (water with/without class A foam), or helicopters can slow the rate of spread and reduce fireline intensity in an effort to buy time for ground resources to take action. In any case, through standing agreement between the Office of the Fire Commissioner, the Fire Chiefs Association of BC, and the BC Wildfire Service, mutual aid from the BCWS, including aircraft is available to support fire departments inside their fire protection boundaries.

Departments that have a higher probability of requiring assistance from BCWS should be afforded any additional cross-training that would assist with multi-agency coordination and safe operations around firefighting aircraft. This could include additional airtanker awareness training.

6.1.4 Access and Evacuation

Populated areas in the WUI that have a single access/egress route, or areas that might necessitate driving steep, winding or narrow roads require careful consideration for residents and responders. These road characteristics create a risk of fire entrapment during evacuation or the impediment of firefighting resources attempting to access the incident.

Several areas with single access/egress routes that could prove to be problematic during a wildfire evacuation scenario were identified during the threat assessments. In some cases (e.g. fuel treatment unit EA_I_005 White Lake Road -West), treatment recommendations were designed in an attempt to increase the wildfire resilience of the area through which the

evacuation route passes. Other areas, such as Kaleden and the roads accessed via lower Lakehill Road, where several tight curves and steep narrow grades exist, mitigation opportunities are fewer or dependent on private property fuel management. In these cases, the ability of residents to evacuate in a timely and orderly fashion is critical to ensuring that people can safely get out of the way of an advancing wildfire.

As evacuation route considerations most often encompass multiple hazards in addition to wildfire threat (e.g. flooding, debris flow, hazardous materials incidents etc.) it is recommended that the RDOS pursue evacuation route planning projects[7] that address (among other hazards) the issue of single access/egress routes for populated areas. Secondary to the issue of single access/egress routes is the issue related to narrow, tight-curved roads that could become pinch points or bottlenecks during an evacuation, which should be considered in the course of an evacuation planning project.

6.1.5 Training

In the past several years, the SPP-WFF 1 (Wildland Firefighter Level 1) course replaced the S-100 training for fire departments in BC (Office of the Fire Commissioner 2013). As referenced in 6.1.3, additional cross-training, particularly regarding the use of firefighting aircraft is a reasonable training recommendation for departments that have a higher likelihood of receiving air support from BCWS (as is the case for all RDOS departments).

6.2 Structure Protection

There are recent examples of wildland urban interface fires (e.g. Glenrosa 2009, Seclusion Bay 2010 etc.) where the deployment of structure protection sprinkler systems was not possible or practical during the initial attack. While engaged in the critical initial attack phase of suppression, finite resources are often exclusively dedicated to life safety (i.e. rescues and evacuation) and fire control. The ability to undertake structure assessments, plan and deploy structure protection sprinklers is often not possible during the emergent stages of a developing WUI fire. Structure protection units (SPUs) and SPU crews and specialists are most often deployed to fires that either already or have the potential to become longer duration

[7] The RDOS currently has a funded evacuation route planning project underway, however the issue of single access/egress routes may too fine scale for the current project scope.

project fires where extensive areas require SPU capability. In these cases, Type 1 SPU trailers are often deployed.

Homeowners should not solely rely on whether SPU capabilities can be installed on their home in time to save it. Rather, an active and concerted effort needs to be taken by residents to assess and mitigate hazards that affect the ignitability of their homes *before* a wildland urban interface fire disaster unfolds. It will never be possible to dedicate sprinklers and firefighters to protect every home in BC from wildfire – homeowners need to take action themselves ahead of time.

That being said, the region periodically experiences large expanded attack wildfires that occasionally necessitates the deployment of SPU capabilities. As such, there is rationale for the maintenance of 2-3 Type 2 SPUs housed strategically at RDOS fire departments. During periods of lower fire danger these resources could be made available for deployment elsewhere in the province under cost-recovery.

6.3 Summary of Recommendations

Recommendation	Responsibility/Funding Source	Next Steps
Undertake evacuation route planning that includes the identification of single access/egress routes to populated areas in relation to wildfire threat	RDOS with UBCM funding support. RDOS is currently undertaking an evacuation planning project.	• Identify all single access/egress routes to populated areas, and areas of potential congestion (i.e. bottlenecks, pinch points etc.) in proximity to Moderate to Extreme potential fire behaviour • Develop strategies, tactics and trigger points that facilitate safe evacuation or shelter-in-place for the public
Pursue enhanced cross-training with BCWS	RDOS and BCWS with UBCM funding support	• Open dialogues with the appropriate BCWS Fire Zone Wildfire Officer to determine the feasibility of: o Initiating enhanced cross-training opportunities to facilitate multi-agency coordination and safety, including enhanced airtanker use and safety training.
Increase the SPU capabilities within the RDOS to include 2-3 strategically located Type 2 SPUs	RDOS with funding support from Office of the Fire Commissioner (OFC)	• Determine most appropriate home departments, taking into account: o Storage capacity o Interest o Regional distribution

References

ABCFP. 2013. "Interim Guidelines - Fire and Fuel Management." *Association of British Columbia Forest Professionals.* May. Accessed July 15, 2018. https://member.abcfp.ca/web/Files/policies/Fire_Fuel_Management-Interim_Guidelines.pdf.

Auditor General of British Columbia. 2005. "Joint Follow-up of 2001/2002: Report 1 Managing Interface Fire Risks and Firestorm 2003 Provincial Review." https://www.bcauditor.com/sites/default/files/publications/2005/report2/report/managing-interface-fire-risks-and-firestorm-2003-provincial-review.pdf.

Auditor General of British Columbia. 2001. "Managing interface fire risks." Accessed October 26, 2018. https://www.bcauditor.com/sites/default/files/publications/2001/report1/report/managing-interface-fire-risks.pdf.

BC Hydro. 2017. "Transmission System BCH DWG. NO. G-T06-0010." *BC Hydro Transmissions and Stations Planning.* December 17. Accessed January 15, 2020. https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/suppliers/transmission-system/maps/transplt.pdf.

BC Wildfire Service. 2016. *Wildfire Glossary.* July 21. Accessed January 12, 2020. https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary#V.

BCCDC. 2018. *BC Centre for Disease Control, Smoky skies in B.C. can create health problems for some.* Accessed November 8, 2018. http://www.bccdc.ca/about/news-stories/stories/2018-wildfire-smoke.

Butler, Brett W., and Jack D. Cohen. 1998. "Modeling potential structure ignitions from flame radiation exposure with implications for wildland/urban interface fire management." *Proceedings of the 13th Fire and Forest Meteorology Conference* (International Association of Wildland Fire) 81-86.

Calkin, David E., Jack D. Cohen, Mark A. Finney, and Matthew P. Thompson. 2014. "How Risk Management Can Prevent Future Wildfire Disasters in the Wildland-Urban Interface." *Proceedings of the National Academy of Sciences* 111 (2): 746-751.

City of Penticton. 2019. "Official Community Plan Bylaw No. 2019-08." *City of Penticton.* August 6. Accessed January 25, 2020. https://www.penticton.ca/assets/Departments/Planning~and~Land~Use/Documents/2019-08%20Official%20Community%20Plan%20Bylaw.pdf.

Cohen, Jack D. 2004. "Relating flame radiation to home ignition using modeling and experimental crown fires." *Canadian Journal of Forest Research* 34 (8): 1616-1626.

Cohen, Jack. 2000. "Preventing disaster: Home ignitability in the wildland-urban interface." *Journal of Forestry* 98 (3): 15-21.

Cohen, Jack. 2008. "The wildland-urban interface fire problem." *Forest History Today* Fall 2008: 20-26.

Cohen, Jack, and Jim Saveland. 1997. "Structure Ignition Assessment Can Help Reduce Fire Damages in the W-UI." *Fire Management Notes* (USDA Forest Service) 57 (4). https://www.fs.fed.us/fire/fmt/fmt_pdfs/fmn57-4.pdf#structureignitionassessmentcanhelpreducefiredamagesinthewui.

Data BC. 2019. "BC Wildfire Active Weather Stations." *Data Catalogue*. July. https://catalogue.data.gov.bc.ca/dataset/bc-wildfire-active-weather-stations.

DataBC. 2019. *Data Distribution Service*. Accessed July 7, 2019. https://apps.gov.bc.ca/pub/dwds/home.so.

Davies, John, Mike Coulthard, and Nick Zukanovic. 2011. "Regional District of Okanagan-Similkameen Community Wildfire Protection Plan." March 31. Accessed November 9, 2018. http://www.rdosmaps.bc.ca/min_bylaws/Community_Services/Wildfire_Protection_Program/RDOS_CWPP_FINAL.pdf.

District of Summerland. 2015. "Official Community Plan, Bylaw No. 2014-002." *District of Summerland*. July 27. Accessed January 25, 2020. https://www.summerland.ca/planning-building/official-community-plan.

Duran, Sandra. 2014. *Evidence Review: Wildfire smoke and public health risk*. Vancouver: BC Centre for Disease Control. Accessed November 9, 2018. http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/Health-Environment/WFSG_EvidenceReview_WildfireSmoke_FINAL_v3_edstrs.pdf.

Filmon, Gary, Donald Leitch, and Jim Sproul. 2004. "Firestorm 2003 Provincial Review." *Legislative Assembly of British Columbia*. February 15. Accessed December 12, 2019. http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/367694/Firestorm_Report.pdf.

FireSmart Canada. 2012. "FireSmart Guide to Landscaping." June 28. Accessed December 12, 2018. https://www.firesmartcanada.ca/images/uploads/resources/FireSmart-Guide-to-Lanscaping.pdf.

Forest Practices Board. 2012. *Fire Management Planning Special Investigation*. Victoria: BC Forest Practices Board. https://www.bcfpb.ca/wp-content/uploads/2016/05/SIR34-Fire-Management-Planning.pdf.

FortisBC. 2011. *Service Areas*. Accessed November 4, 2018. https://www.fortisbc.com/About/ServiceAreas/Pages/default.aspx.

—. 2004. "Transmission and Distribution System Development Plan." November 26. Accessed November 8, 2018. https://www.bcuc.com/Documents/Proceedings/2010/DOC_24309_B-3-3-2_FortisBC-ResponsesIR-No-1-BCMEU-Appendix-A15.1a.pdf.

Lawson, B. D., B. J. Stocks, M. E. Alexander, and C. E. Van Wagner. 1985. "A System for Predicting Fire Behaviour in Canadian Forests." *Eighth Conference on Fire and Forest Meteorology 1985.* Detroit: Society of American Foresters. 6-16.

Moritz, Max, Enric Batllori, Ross A. Bradstock, Malcolm A. Gill, John Handmer, Paul F. Hessburg, Justin Leonard, et al. 2014. "Learning to coexist with wildfire." *Nature* 515: 58-66.

Morrow, Bruce, Kelly Johnston, and John Davies. 2013. "Wildland Urban Interface Wildfire Threat Assessments in B.C." January 24. Accessed June 12, 2018. http://fness.bc.ca/wp-content/uploads/2017/07/WTA-Guide-2012-Update.pdf.

Naeher, LP, M Brauer, M Lipsett, JT Zelikoff, CD Simpson, and JQ Koenig. 2007. "Woodsmoke health effects: a review." *Inhalation Toxicology* 19 (1): 67-106.

Office of the Fire Commissioner. 2013. "Emergency Management BC." *Structure Protection Program (SPP) Training.* December. Accessed January 8, 2020 . https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/fire-safety/wildfire/spp-wff1-info.pdf.

Pacific Climate Impacts Consortium. 2012. *Plan2Adapt.* June 1. Accessed January 8, 2020. https://pacificclimate.org/analysis-tools/plan2adapt.

Parminter, John. 1995. "Human influence on landscape pattern in the Pacific Region: impacts of burning by First Nations and early European settlers." *Landscape Ecology Symposium, 75th Annual Meeting of the Pacific Division, American Association for the Advancement of Science.* Vancouver.

Partners in Protection. 2003. *FireSmart: Protecting your Community from Wildfire.* 2nd. Edmonton: Partners in Protection.

Pinna Sustainability. 2020. "Climate Projections for the Okanagan Region." *RDOS.* February. Accessed February 15, 2020. https://www.rdos.bc.ca/assets/Uploads/OK-Climate-Projections-Report-Final.pdf.

Province of British Columbia. 2010. "BC Wildland Fire Management Strategy." *BC Wildfire Service.* September. Accessed October 26, 2018. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/wildfire-management/governance/bcws_wildland_fire_mngmt_strategy.pdf.

—. 1995. "Biodiversity Guidebook." Accessed April 3, 2017. https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/biodiv/biotoc.htm.

—. 2012. *FACTSHEET: Prescribed burns and ecosystem restoration burns.* March 30. Accessed October 26, 2018. https://news.gov.bc.ca/factsheets/prescribed-burns-and-ecosystem-restoration-burns.

—. 2006. *Merritt Old Growth Management.* March 31. Accessed January 15, 2020. https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/thompson-okanagan/merritt-old-growth-management.

—. 2001. "Okanagan Shuswap Land and Resource Management Plan." *Strategic Land and Resource Planning*. https://www.for.gov.bc.ca/tasb/slrp/lrmp/kamloops/okanagan/plan/files/oslrmpfull.pdf.

—. 2007. *Plan related legal direction.* https://www.for.gov.bc.ca/tasb/slrp/legal-direction/.

Quarles, Stephen L., and Christine D. Standohar-Alfano. 2017. *Ignition Potential of Decks Subjected to an Ember Exposure.* Tampa: Insurance Institute for Business & Home Safety. Accessed October 31, 2018. http://disastersafety.org/wp-content/uploads/2017/10/Deck-Ember-Testing-Report-2017_IBHS.pdf.

Quarles, Stephen, and Ed Smith. 2011. *The combustibility of landscape mulches.* Reno: University of Nevada Cooperative Extension. Accessed October 31, 2018. https://www.unce.unr.edu/publications/files/nr/2011/sp1104.pdf.

Regional District of Okanagan-Similkameen. 2020. "Area "A" Osoyoos Rural Official Community Plan Bylaw No. 2450, 2008." February 6. Accessed February 6, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/planning/consolidated/2450.pdf.

—. 2020. "Area "C" Oliver Rural Official Community Plan Bylaw No. 2452, 2008." February 6. Accessed February 6, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/planning/consolidated/2452.pdf.

—. 2020. "Area "D" East-Skaha Vaseux Official Community Plan Bylaw No. 2603, 2013." February 6. Accessed February 6, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/planning/consolidated/2603.pdf.

—. 2020. "Area "E" Naramata Area Official Community Plan, Bylaw No. 2458, 2008." *RDOS.* February 6. Accessed February 6, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/planning/consolidated/2458.pdf.

—. 2020. "Area "F" Okanagan Lake West Greater West Bench Official Community Plan, Bylaw No. 2790, 2018." *RDOS.* February 6. Accessed February 6, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/planning/consolidated/2790.pdf.

—. 2019. "Area "G" Rural Keremeos Zoning Bylaw No. 2781, 2017." *RDOS.* December 5. Accessed January 25, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/planning/consolidated/2781.pdf.

—. 2019. "Area "H" Official Community Plan, Bylaw No. 2497, 2012." *RDOS*. December 5. Accessed January 25, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/planning/consolidated/2497.pdf.

—. 2020. "Area "I" Kaleden / Apex / Twin Lakes / St. Andrews Official Community Plan, Bylaw No. 2683, 2016." *RDOS*. February 6. Accessed February 6, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/planning/consolidated/2683.pdf.

—. 2006. "Bylaw No. 2375, 2006 - A bylaw to establish an Emergency Planning Program Service." August 17. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/finance/2006/BL2375.pdf.

—. 2010. "Emergency Response and Recovery Plan." March. Accessed December 4, 2019. http://www.rdosmaps.bc.ca/min_bylaws/Community_Services/Emergency_Services/RDOS_ERRP.pdf.

—. 2019. "Fire Department Operational Bylaw No. 2857, 2019." *RDOS*. May 23. Accessed January 10, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/leg_services/RDOS/2019/BL2857.pdf .

—. 2006. "Open Air Burning Regulations within the Regional District of Okanagan-Similkameen Bylaw No. 2364, 2005." *RDOS*. April 15. Accessed January 25, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/leg_services/RDOS/2009/BL2364_Consolidated.pdf.

—. 2005. "RDOS Bylaws." *Anarchist Mountain Fire Protection Service Establishment Bylaw No. 2334, 2005*. July 21. Accessed January 8, 2020. http://www.rdosmaps.bc.ca/min_bylaws/bylaws/leg_services/RDOS/2005/Bylaw2334.pdf.

Statistics Canada. 2017. *Focus on Geography Series, 2016 Census - Okanagan-Similkameen, Regional District*. April 23. Accessed December 12, 2019. https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-cd-eng.cfm?LANG=Eng&GK=CD&GC=5907&TOPIC=1.

Taylor, S. W., and M. E. Alexander. 2016. *Field Guide to the Canadian Forest Fire Behaviour Prediction (FBP) System*. 2nd . Edmonton: Natural Resources Canada, Canadian Forest Service, Nothern Forestry Centre.

Town of Oliver. 2017. "Official Community Plan Bylw No. 1370." *Town of Oliver*. March 13. Accessed January 25, 2020. https://oliver.civicweb.net/document/71183.

Town of Osoyoos. 2007. "Official Community Plan Bylaw No. 1230, 2007." *Town of Osoyoos*. March 19. Accessed January 25, 2020. https://osoyoos.civicweb.net/document/19344.

Town of Princeton. 2008. "Official Community Plan Bylaw No. 808, 2008." *Town of Princeton*. September 15. Accessed January 25, 2020. https://princeton.civicweb.net/document/132.

Union of BC Municipalities. 2019. *Community Resiliency Investment.* May 31. Accessed November 6, 2019. https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html.

Village of Keremeos. 2016. "Official Community Plan Bylaw No. 807, 2013." *Village of Keremeos*. December 19. Accessed January 25, 2020. https://keremeos.civicweb.net/filepro/documents/?preview=3342.

Westhaver, Alan. 2017. *Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster.* Toronto: Institute for Catastrohic Loss Reduction. Accessed January 16, 2018. https://www.iclr.org/wp-content/uploads/PDFS/why-some-homes-survived-learning-from-the-fort-mcmurray-wildland-urban-interface-fire-disaster.pdf.

Appendix 1: Local Wildfire Threat Process

A1.1 Fuel Type Attribute Assessment

The issue of fuel type is somewhat more complicated in BC compared to other parts of Canada, owing to the diversity and breadth of ecosystems in this province. Fuel types are a primary input to the Canadian Forest Fire Behaviour Prediction (FBP) System and form the basis for predicting rate of spread, type of fire and fire intensity class (i.e. the primary components of the FBP system). Although FBP fuel types are intended to be viewed qualitatively and not quantitatively, many forest types in BC simply do not represent a good fit with the established national FBP fuel types.

The FBP system is an adequate tool for wildfire pre-suppression (i.e. preparedness) and suppression operations. Systems such as FBP are "intended to assist firefighters and officers in estimating potential fire behaviour in constant conditions…" (Taylor & Alexander, 2016). The utility of FBP in quantifying wildfire threat or risk or assessing forest types for the purposes of prescribing long-term fuel management treatments is not well documented or reviewed. An ecological approach to describing wildland fuels provides greater opportunity to describe characteristics related to stand structure and biomass, as it relates to wildland fire behaviour.

The ecology of The RDOS AOI is predominantly characterized by the Interior Douglas-fir and Ponderosa Pine biogeoclimatic zones, as summarized in Table 13.

The natural disturbance patterns of the IDFxh1, PPxh1 and IDFdm1 have been characterized by historically frequent stand maintaining fires (i.e. fires in the NDT4, as discussed in 4.2) prior to the fire-return interval being interrupted by contemporary forest management and fire suppression policies. Stand maintaining fires are typically low intensity surface burns that consume understory fuels while retaining a healthy green overstory. These frequent fires kept ladder fuels to a minimum and typically resulted in an open, park-like stand structure.

In the absence of periodic low intensity fire in the area, small trees that would have typically been fire-killed have become established, forming thickets and creating ladder fuels and resulting in relatively higher tree densities. Fine fuels, such as dead Ponderosa pine needles, often accumulate at the base of mature trees, resulting in higher fine fuel loading that could produce fire intensity great enough to result in lethal scorching of trees whose thick bark would have otherwise protected the vital phloem and cambial tissues.

The FBP fuel types for most interface areas in The RDOS are classified as either Grass or Ponderosa Pine Douglas-fir; termed the O1 and C7 fuel types, respectively (Table 14). The C7 fuel type lends itself well to manual fuel treatments that target the small diameter understory conifers and retains the larger diameter overstory layer. However, a C7 fuel type that undergoes this type of treatment (often referred to as "thinning from below"), ultimately remains a C7 fuel type since the FBP system has limited options for modifying C7 predictions.

At higher elevations, in the MS and ICH zones and certain IDF subzones, C-3 and M-1/2 fuel types are more or less the best (but far from perfect) fit. These areas are more typical of a stand replacement fire regime, whereby high-severity fire results in a relatively higher proportion of tree mortality. Wet belt ecosystems, such as the ICH are notoriously challenging to classify according to fuel type. Often the best option is the M-2 or C-5 fuel types, though these are nowhere near a perfect match. The ICH zone is often typical of a mixed-severity fire regime, whereby examples of both relatively low-intensity and stand-replacing fires can be found on the landscape.

The FBP fuel type distribution for each Electoral Area are presented in Tables 16 to 24 and a generalized classification of all FBP fuel types, according to spotting potential, is provided in Table 26.

Table 17 Fuel type distribution in Electoral Area A.

FBP Fuel Type	Area (ha)	%
O-1a Matted/Cut Grass O-1b Standing Grass	12,445	41%
C-7 Ponderosa Pine/Douglas-fir	7,626	25%
Non-fuel (water, urban, cultivation etc.)	3,714	12%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	3,487	11%
C-3 Mature Jack or Lodgepole Pine	1,872	6%
D-1 Leafless Aspen D-2 Green Aspen	1,031	3%
S-1 Jack or Lodgepole Pine Slash	355	1%
C-4 Immature Jack or Lodgepole Pine	17	0.1%
C-2 Boreal Spruce	6	0.02%
	30,553	100%

Table 18 Fuel type distribution in Electoral Area B.

FBP Fuel Type	Area (ha)	%
O-1a Matted/Cut Grass O-1b Standing Grass	10,323	38%
C-7 Ponderosa Pine/Douglas-fir	7,704	28%
C-3 Mature Jack or Lodgepole Pine	4,312	16%
Non-fuel (water, urban, cultivation etc.)	3,307	12%
D-1 Leafless Aspen D-2 Green Aspen	1,131	4%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	562	2%
C-2 Boreal Spruce	42	0.2%
C-4 Immature Jack or Lodgepole Pine	3	0.01%
	27,383	100%

Table 19 Fuel type distribution in Electoral Area C.

FBP Fuel Type	Area (ha)	%
C-7 Ponderosa Pine/Douglas-fir	16,115	30%
O-1a Matted/Cut Grass O-1b Standing Grass	15,505	29%
C-3 Mature Jack or Lodgepole Pine	10,687	20%
Non-fuel (water, urban, cultivation etc.)	5,018	9%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	4,115	8%
D-1 Leafless Aspen D-2 Green Aspen	1,257	2%
S-1 Jack or Lodgepole Pine Slash	1,023	2%
C-4 Immature Jack or Lodgepole Pine	333	1%
C-2 Boreal Spruce	149	0.3%
C-1 Spruce-Lichen Woodland	45	0.1%
S-2 White Spruce/Balsam Slash	3	0.01%
C-5 Red and White Pine	3	0.01%
	54,252	100%

Table 20 Fuel type distribution in Electoral Area D.

FBP Fuel Type	Area (ha)	%
C-3 Mature Jack or Lodgepole Pine	24,392	41%
C-7 Ponderosa Pine/Douglas-fir	15,515	26%
O-1a Matted/Cut Grass O-1b Standing Grass	8,012	14%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	4,434	7%
S-1 Jack or Lodgepole Pine Slash	2,415	4%
Non-fuel (water, urban, cultivation etc.)	2,289	4%
D-1 Leafless Aspen D-2 Green Aspen	986	2%
C-4 Immature Jack or Lodgepole Pine	921	2%
C-2 Boreal Spruce	212	0.4%
S-2 White Spruce/Balsam Slash	36	0.1%
C-5 Red and White Pine	19	0.03%
C-1 Spruce-Lichen Woodland	11	0.02%
	59,242	100%

Table 21 Fuel type distribution in Electoral Area E.

FBP Fuel Type	Area (ha)	%
C-3 Mature Jack or Lodgepole Pine	18,159	33%
C-7 Ponderosa Pine/Douglas-fir	11,942	22%
O-1a Matted/Cut Grass O-1b Standing Grass	11,624	21%
Non-fuel (water, urban, cultivation etc.)	6,063	11%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	2,380	4%
C-2 Boreal Spruce	2,289	4%
S-1 Jack or Lodgepole Pine Slash	1,535	3%
D-1 Leafless Aspen D-2 Green Aspen	166	0.3%
C-4 Immature Jack or Lodgepole Pine	55	0.1%
S-2 White Spruce/Balsam Slash	26	0.0%
	54,239	100%

Table 22 Fuel type distribution in Electoral Area F.

FBP Fuel Type	Area (ha)	%
C-7 Ponderosa Pine/Douglas-fir	27,188	40%
C-3 Mature Jack or Lodgepole Pine	17,834	26%
O-1a Matted/Cut Grass O-1b Standing Grass	11,232	17%
Non-fuel (water, urban, cultivation etc.)	5,291	8%
S-1 Jack or Lodgepole Pine Slash	4,126	6%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	780	1%
D-1 Leafless Aspen D-2 Green Aspen	581	1%
C-2 Boreal Spruce	181	0.3%
C-4 Immature Jack or Lodgepole Pine	84	0.1%
S-2 White Spruce/Balsam Slash	44	0.1%
C-5 Red and White Pine	18	0.0%
	67,359	100%

Table 23 Fuel type distribution in Electoral Area G.

FBP Fuel Type	Area (ha)	%
C-3 Mature Jack or Lodgepole Pine	100,552	47%
C-7 Ponderosa Pine/Douglas-fir	49,577	23%
O-1a Matted/Cut Grass O-1b Standing Grass	42,559	20%
Non-fuel (water, urban, cultivation etc.)	8,303	4%
S-1 Jack or Lodgepole Pine Slash	4,423	2%
D-1 Leafless Aspen D-2 Green Aspen	3,752	2%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	3,236	1%
C-2 Boreal Spruce	1,732	1%
C-5 Red and White Pine	1,012	0.5%
C-4 Immature Jack or Lodgepole Pine	310	0.1%
S-2 White Spruce/Balsam Slash	297	0.1%
	215,753	100%

Table 24 Fuel type distribution in Electoral Area H.

FBP Fuel Type	Area (ha)	%
C-3 Mature Jack or Lodgepole Pine	200,662	42%
C-7 Ponderosa Pine/Douglas-fir	149,978	31%
O-1a Matted/Cut Grass O-1b Standing Grass	66,327	14%
S-1 Jack or Lodgepole Pine Slash	24,019	5%
Non-fuel (water, urban, cultivation etc.)	19,982	4%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	6,166	1%
C-2 Boreal Spruce	4,388	1%
D-1 Leafless Aspen D-2 Green Aspen	3,386	1%
S-2 White Spruce/Balsam Slash	1,733	0.4%
C-4 Immature Jack or Lodgepole Pine	1,378	0.3%
C-5 Red and White Pine	398	0.1%
C-1 Spruce-Lichen Woodland	36	0.0%
	478,452	100%

Table 25 Fuel type distribution in Electoral Area I.

FBP Fuel Type	Area (ha)	%
C-7 Ponderosa Pine/Douglas-fir	20,189	42%
O-1a Matted/Cut Grass O-1b Standing Grass	16,721	35%
C-3 Mature Jack or Lodgepole Pine	5,577	12%
Non-fuel (water, urban, cultivation etc.)	3,364	7%
D-1 Leafless Aspen D-2 Green Aspen	886	2%
S-1 Jack or Lodgepole Pine Slash	496	1%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	373	1%
C-2 Boreal Spruce	35	0.1%
C-5 Red and White Pine	26	0.1%
C-4 Immature Jack or Lodgepole Pine	2	0.0%
	47,669	100%

Table 26 Fuel type categories and relative spotting potential.

Fuel Type Categories	Fuel Type - Crown Fire/ Spot Potential
1: C1, C2, C4, M3-M4 (>50% C/DF)	High
2: C3, C7, M3-M4 (<50% C/DF) M1-M2 >50% Conifer	Moderate
3: C5, C6, O1a/b, S1- S3[1] M1-M2 (26-49% Conifer)	Low
4: D1, D2, M1-M2 (<26% Conifer)	Very Low

A1.2 Proximity of Fuel to the Community

Wildland fuels closest to built-up areas usually represent the highest hazard to communities. The common recommended approach (i.e. SWPI, CRI, FireSmart and others) is to reduce fuel hazards from the value or structure outward, ensuring mitigation continuity. Untreated areas adjacent to the value or structure may allow a wildfire to build in intensity and rate of spread, which can increase the risk to the value. To capture the importance of fuel proximity in the local wildfire threat assessment, the WUI is weighted more heavily from the value or structure outwards. Fuels adjacent to the values and/or structures at risk receive the highest rating followed by progressively lower ratings moving out.

The local wildfire threat assessment process subdivides the WUI into three areas – the first 100 meters (WUI 100), 101 to 500 meters (the WUI 500), and 501 to 2000 meters (the WUI 2000).

These zones provide guidance for classifying threat levels and subsequent priorities of treatments.

Where fuel treatments are intended to reduce the risk to values in the built environment, the generally accepted practice is to begin treatments at the values and progress outwards. This strategy most often straddles the boundaries between private and public land and requires a coordinated effort to have any meaningful result. When gaps of untreated fuel are left, regardless of land status, the overall effectiveness of adjacent fuel treatments can become reduced or completely negated.

A1.3 Fire Spread Patterns

The BCWS has prepared ISI roses for each of its fire weather stations across the province, with the expectation that they be included in community wildfire protection planning. Similar to a wind rose, the ISI rose uses the direction and magnitude of ISI, which is a numeric rating of expected rate of fire spread that combines the effect of wind and the fine fuel moisture code (FFMC). Due to the effect of local topography on wind patterns, the utility of ISI roses for anywhere but the immediate area surrounding a fire weather station is extremely doubtful and caution is recommended if attempting to extrapolate fire behaviour spread information at any distance beyond the area of topographic influence for a given station.

A1.4 Topography

In the context of the fire environment, topography refers to the shape and features of the landscape. Of primary importance for an understanding of fire behaviour is slope. When all other factors are equal, a fire will spread faster up a slope than it would across flat ground. When a fire burns on a slope, the upslope fuel particles are closer to the flame compared to the downslope fuels. As well, hot air rising along the slope tilts the flame uphill, further increasing the ease of ignition of upslope fuels. A pre-heating effect on upslope fuels also contributes to faster upslope fire spread.

Topography influences fire behavior principally by the steepness of the slope. However, the configuration of the terrain such as narrow draws, saddles and so forth can also influence fire spread and intensity. Slope aspect (i.e. the cardinal direction that a slope faces) determines the amount and quality of solar radiation that a slope will receive, which in turn influences plant growing conditions and drying rates.

The 2012 Wildfire Threat Assessment Guide (used for this CWPP) classifies slope slightly differently than the 2017 Wildfire Risk Classification process, but the intended outcome is similar – to characterize slope steepness in terms of how a wildfire will spread and behave on a given slope. The classifications ultimately attempt to reflect the role of slope as a primary input of the Canadian Forest Fire Behaviour Prediction System (FBP), which underpins much of the threat characterization and mitigation work in BC and elsewhere.

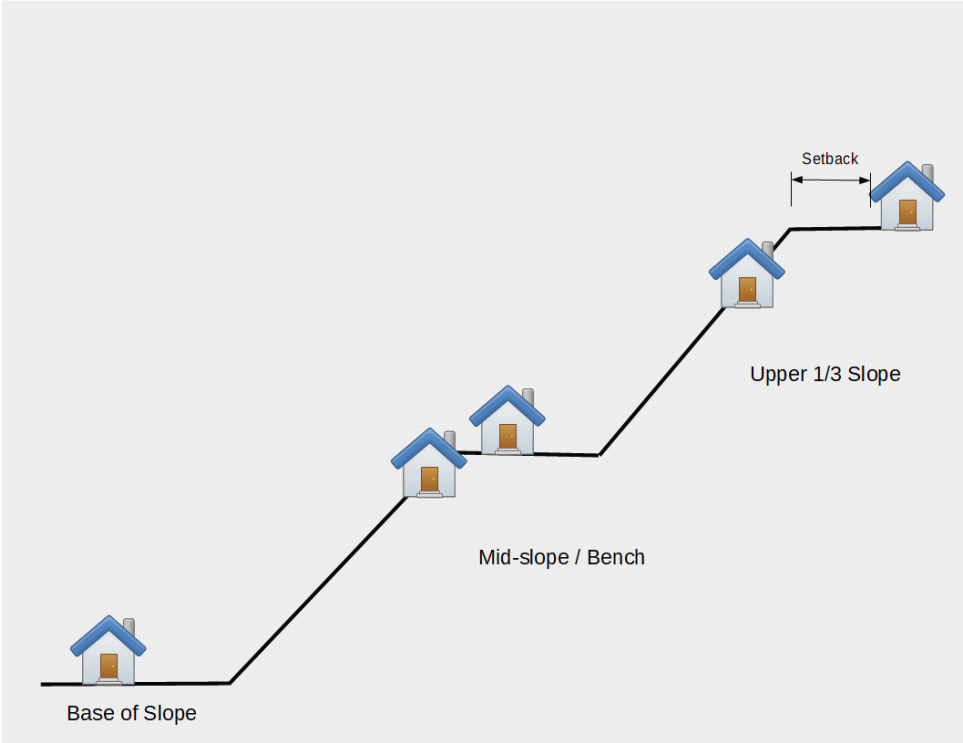

Figure 29 Relative slope positions of values at risk.

When structures (i.e. values) are situated on or near a slope, the position of the value in relation to the slope corresponds to the relative WUI threat rating. Where a slope is characterized by continuous and available fuel, values situated at the base of the slope are at less risk than values situated on the mid or upper slope (Figure 29). The risk to values that are situated on slope benches is dependant on the degree to which the value is "set back" from the crest of the slope. Adequate setback is where the value is far enough back from the crest of the slope, such that the value is not subjected to the full effects of upslope fire spread coming up from below. FireSmart Canada broadly defines adequate set back as 10 m for a single-story building, with set back increased proportionally for multi-story buildings (Partners in Protection, 2003). Set back is further illustrated in Figure 30.

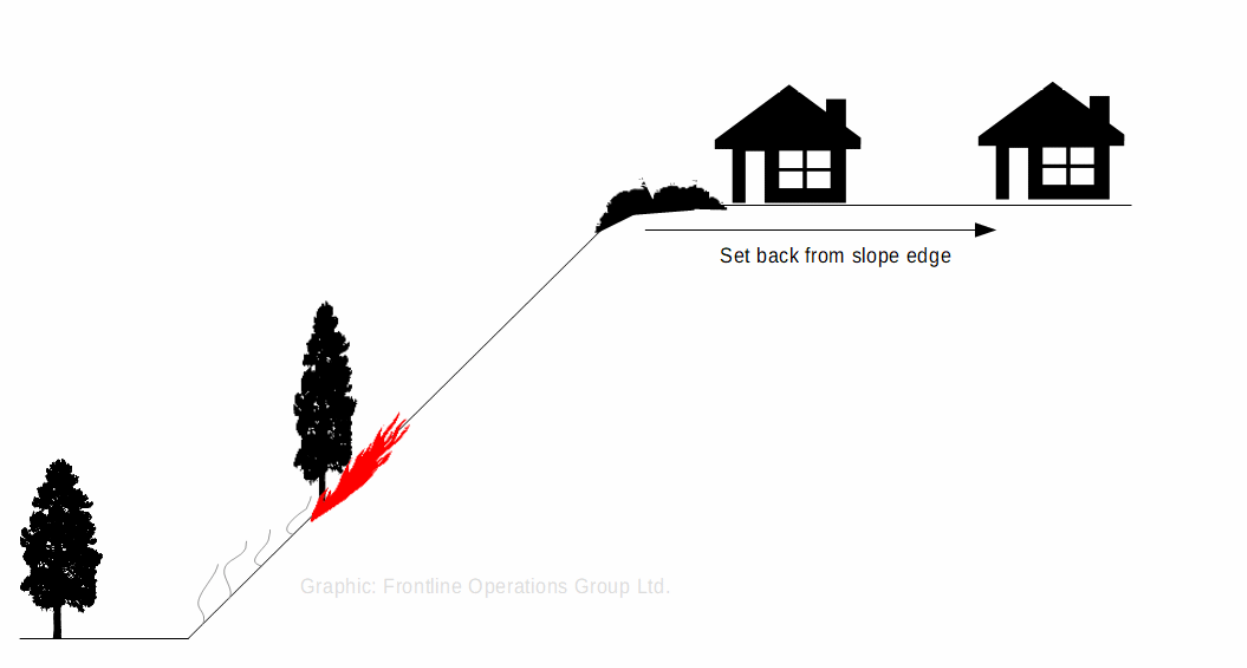

Figure 30 Set-back of structures from slope break in relation to upslope fire spread.

A1.5 Local Wildfire Threat Classification

The Wildfire Risk Analysis (WRA) is a GIS-based model that spatially quantifies and analyzes the relationships that exist between the critical factors affecting wildfire threat. The intent of the analysis is to provide planners with a decision-making tool to spatially identify the risk at the landscape level. This information allows planners to analyze and explore the implications of different management activities in relation to wildfire risk.

The overall rating spatially expresses wildfire threat by incorporating three key components, with specific weightings, as follows:

- Fire Intensity - 50%
- Rate of Spread - 25%
- Crown Fraction Burned - 25%

These three components are in turn calculated from contributing factors, or subcomponents, each of which is represented by a layer in GIS. The layers representing these three components are subsequently overlain to produce the final wildfire threat rating.

Fire Threat / Fire Behaviour

The fire behaviour of the WRA measures how wildfire will behave under extreme weather conditions. The Canadian Fire Behaviour Prediction System (FBP) provides quantitative outputs of selected fire behaviour characteristics for the major Canadian fuel types.

Fuel Types

Sixteen national benchmark fuel types, which are divided into five categories, are used by the Canadian Fire Behaviour Prediction System to forecast how wildfire will react. These fuel types were defined using the forest inventory and guidelines developed by the Ministry of Forests, Lands and Natural Resource Operations. Eleven fuel types were identified in the study area. It is important to note that these fuel types represent a type of behaviour pattern and their names are generic and do not accurately describe the type of stand itself.

Weather

Weather conditions used to calculate fire behaviour were derived from historic government records for two weather stations within the area. This weather data was compiled and statistically analyzed to determine the average 80th percentile fire weather indices for the months of May to September.

Topography

Topographical attributes required to predict fire behaviour include slope and aspect. The study area was delineated into polygons based on slope breaks of 10% intervals and aspects of 45 degrees. The cardinal wind direction was calculated from the aspect so that it was blowing upslope and the elapsed time was set at 24 hours.

All of the data pertaining to fuel types, topographical attributes, and fire weather was compiled for the entire study area. This information was then run through the modeling software (Remsoft FPB97) to create the three output fire behaviour layers: fire intensity, rate of spread and crown fraction burned.

Fire Intensity

This layer is a measure of the rate of heat energy released per unit time per unit length of fire front and is based on the rate of spread and the predicted fuel consumption. The units for this layer are kilowatts per meter.

Rate of Spread

This layer is a measure of the speed at which a fire extends its horizontal dimensions. It is based on the hourly Initial Spread Index (ISI) value and is adjusted for the steepness of slope, the interactions between slope and wind direction and increasing fuel availability as accounted for through the Build Up Index (BUI). The units for this layer are meters per minute.

Crown Fraction Burned

This layer is a measure of the proportion of tree crowns involved in the fire. It is based on the rate of spread, the crown base height and the foliar moisture content and is expressed as a percentage value.

Table 27 Wildfire risk analysis methodology: fire behaviour units and applied weighting.

Layer	Units	Unit Value	Weight
Fire Intensity	Kilowatts per meter (kW/m)	>0-500 501-1000 1001-2000 2001-4000 4001-10000 10001-30000 >30000	4 – Very Low 8 – Low 10 – Low 12 – Medium 16 – Medium 18 – High 20 – Very High
Rate of Spread	Meters per minute (m/min)	>0-5 6-10 11-20 21-40 >40	2 – Very Low 4 – Low 6 – Medium 8 – High 10 – Very high
Crown Fraction Burned	Percent of canopy crown burned (%)	0 1-9 10-49 50-89 90-100	0 – None 3 – Low 6 – Medium 8 – High 10 – Very high

Final Wildfire Threat Rating

The weightings of the fire behaviour layers were designated as follows with a total maximum value of 40 and categorized into threat categories as follows:

Table 28 Wildfire risk analysis methodology: Final wildfire threat rating.

Layer	Weight
Wildfire Threat	0 Very Low (Water) 1-19 Low 20-25 Moderate 26-30 High 31-40 Extreme

***Please note: All areas of Private Land are removed from the analysis as per direction from the BC Wildfire Service.*

A1.6 Local Wildfire Risk Classification

Not applicable, as the 2012 Wildfire Threat Assessment methodology was used.

A1.7 Summary of Fire Risk Classes

Very Low (Blue): These are lakes and water bodies that do not have any forest or grassland fuels. These areas cannot pose a wildfire threat and are not assessed.

Low (Green): This is developed and undeveloped land that will not support significant wildfire spread. Examples: Urban/suburban, farm areas with modified forest fuels; irrigated, managed, and heavily grazed fields; gravel pits; severely disturbed land; fully developed residential and commercial areas not directly adjacent to forested or undeveloped land; areas with no readily combustible vegetation on site.

Moderate (Yellow): This is developed and undeveloped land that will support surface fires only. Homes and structures could be threatened. Examples: Unmanaged fields with more than one year of matted grass in a cured state at sometime during the fire season; grass fields with shrubs and a deciduous tree overstorey; grass fields with coniferous shrubs and tree overstorey

with less than 20% canopy coverage; patches of isolated coniferous stands less than 0.5 ha in size.

High (Orange): Landscapes or stands that: • are forested with continuous surface fuels that will support regular candling, intermittent crown and/or continuous crown fires; • often include steeper slopes, rough or broken terrain with generally southerly and/or westerly aspects; • can include a high incidence of dead and downed conifers; • are areas where fuel modification does not meet an established standard. Examples: Areas of continuous beetle killed pine trees; forested land with coniferous coverage exceeding approximately 40% canopy closure; steep, gullied slopes with a continuous coniferous cover; Douglas-fir stands with a high incidence of dead, dying and downed trees from root rot infestation; open grown coniferous stands with low live crowns that would allow candling of large trees.

Extreme (Red): Consists of forested land with continuous surface fuels that will support intermittent or continuous crown fires. Polygons may also consist of continuous surface and coniferous crown fuels. The area is often one of steep slopes, difficult terrain and usually a southerly or westerly aspect. Examples: Forested land with relatively continuous coniferous canopy closure, in excess of 40%, continuous dead pine; steep, gullied, forest slopes with a continuous coniferous forest cover.

Appendix 2: Wildfire Threat Assessment Worksheets and Photos

The Wildland Urban Interface Wildfire Threat Assessment Worksheets and photos for this CWPP are provided to the client under separate cover to manage the size of this document.

Appendix 3: Additional Wildfire History Information

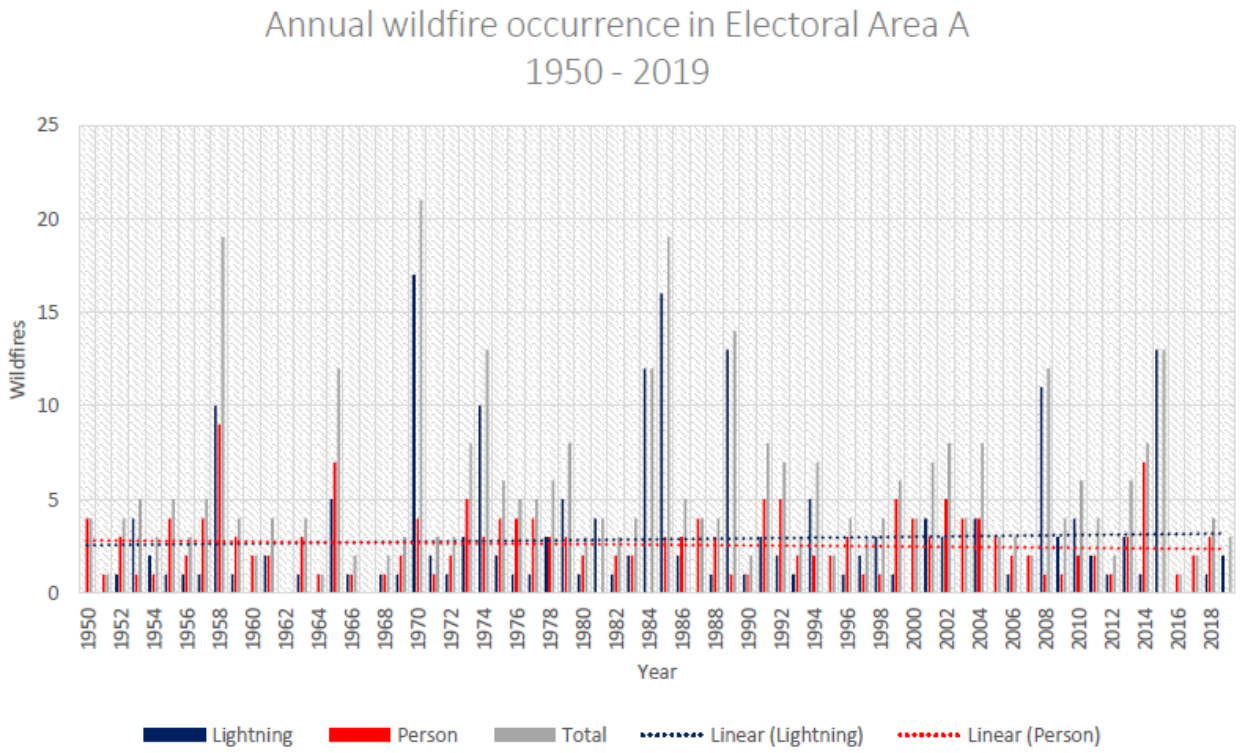

Figure 31 Annual wildfire occurrence in RDOS Electoral Area A from 1950 to 2019.

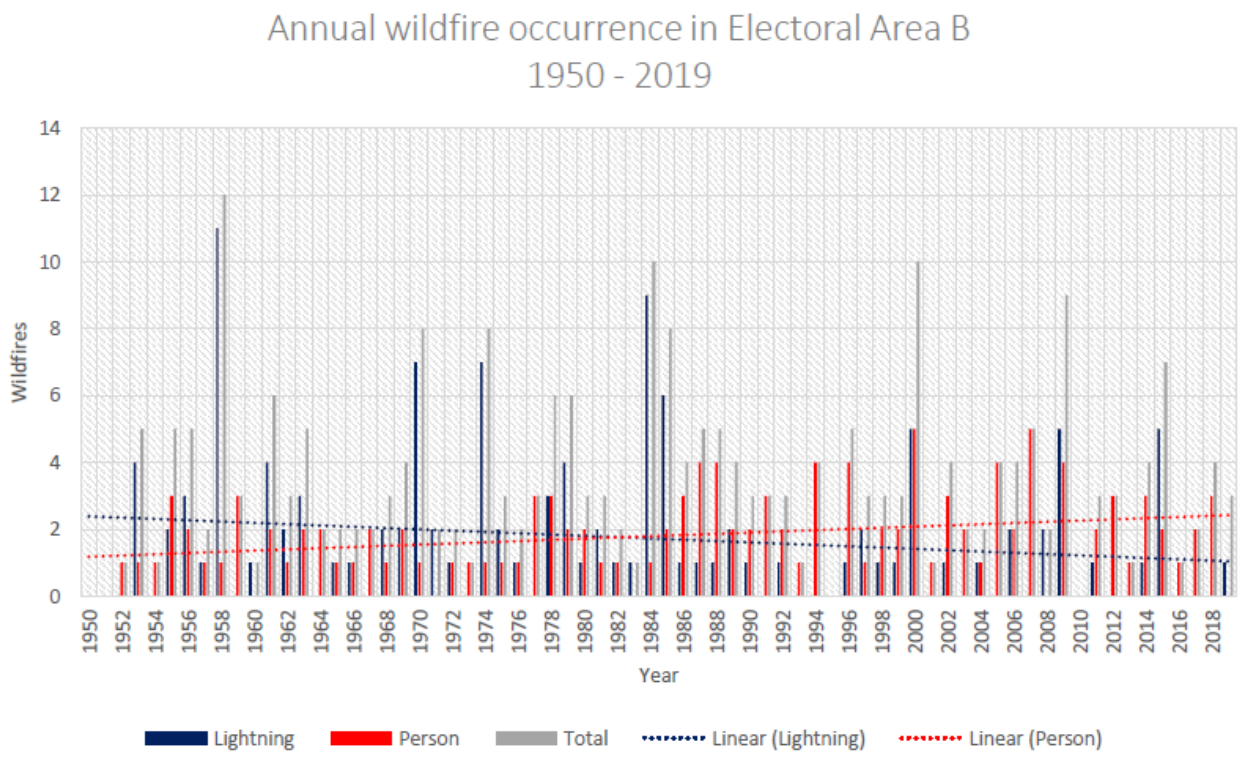

Figure 32 Annual wildfire occurrence in RDOS Electoral Area B from 1950 to 2019.

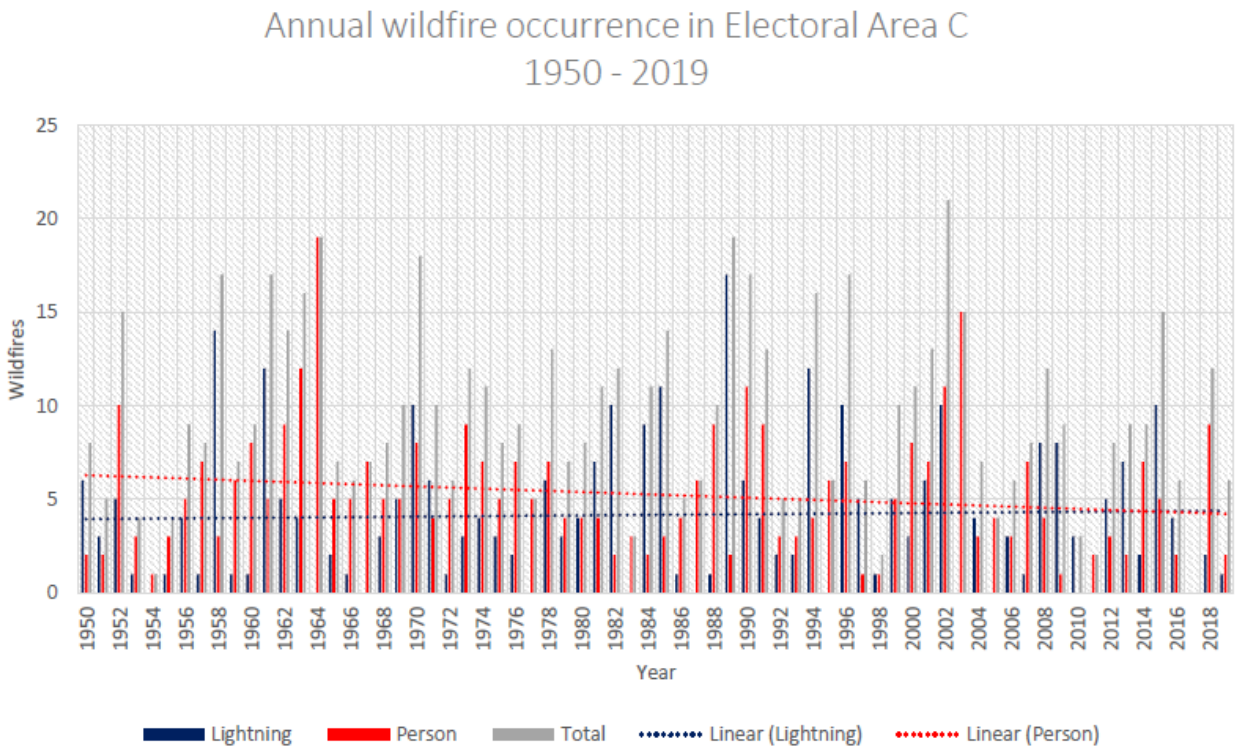

Figure 33 Annual wildfire occurrence in RDOS Electoral Area C from 1950 to 2019.

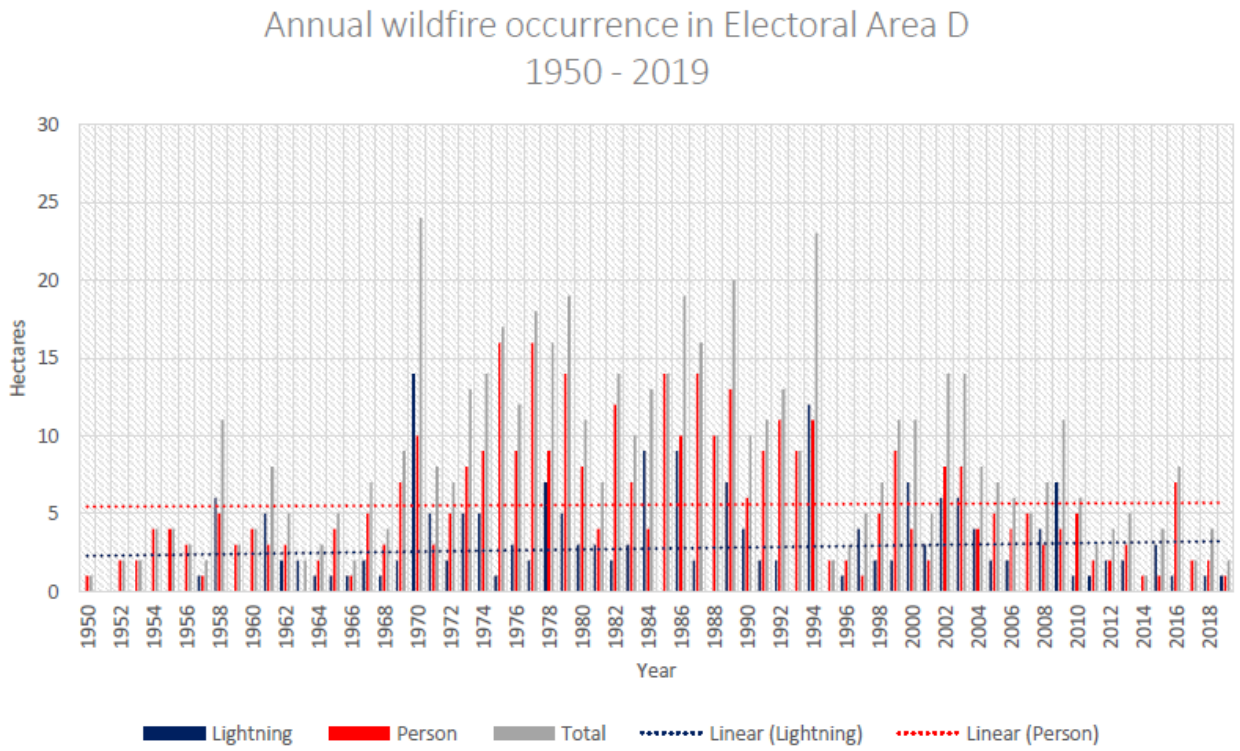

Figure 34 Annual wildfire occurrence in RDOS Electoral Area D from 1950 to 2019.

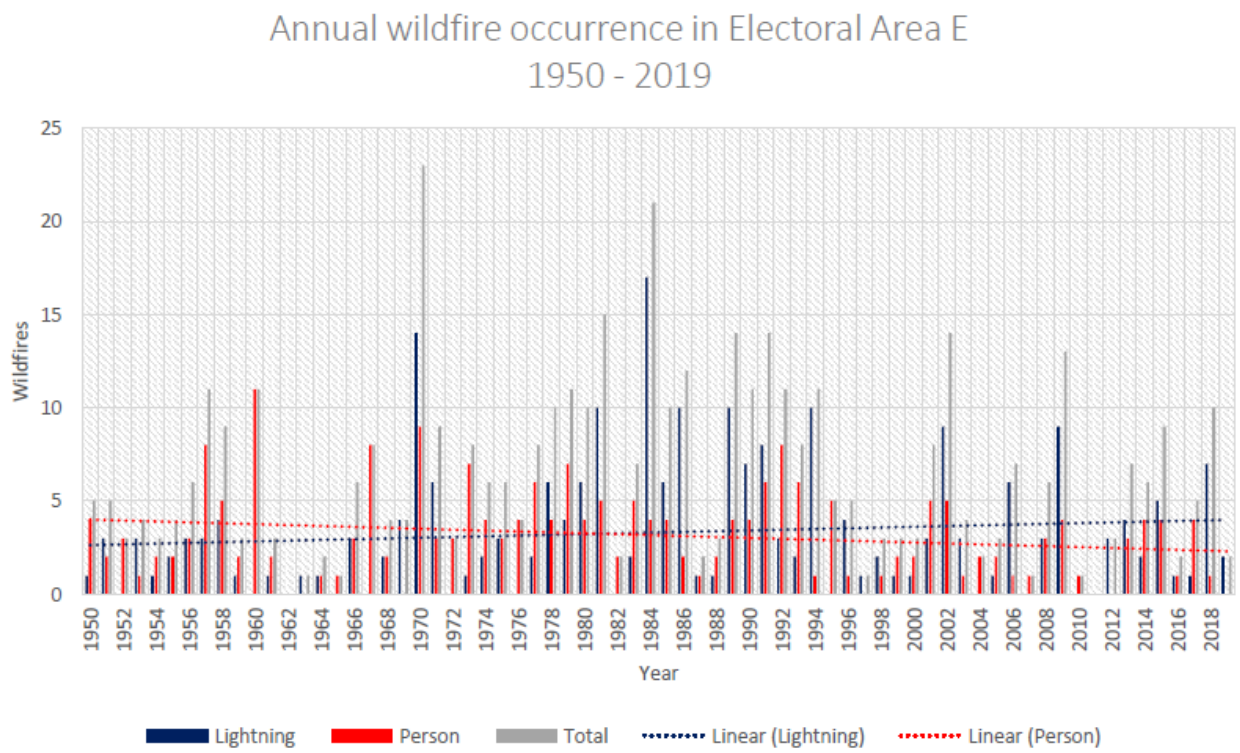

Figure 35 Annual wildfire occurrence in RDOS Electoral Area E from 1950 to 2019.

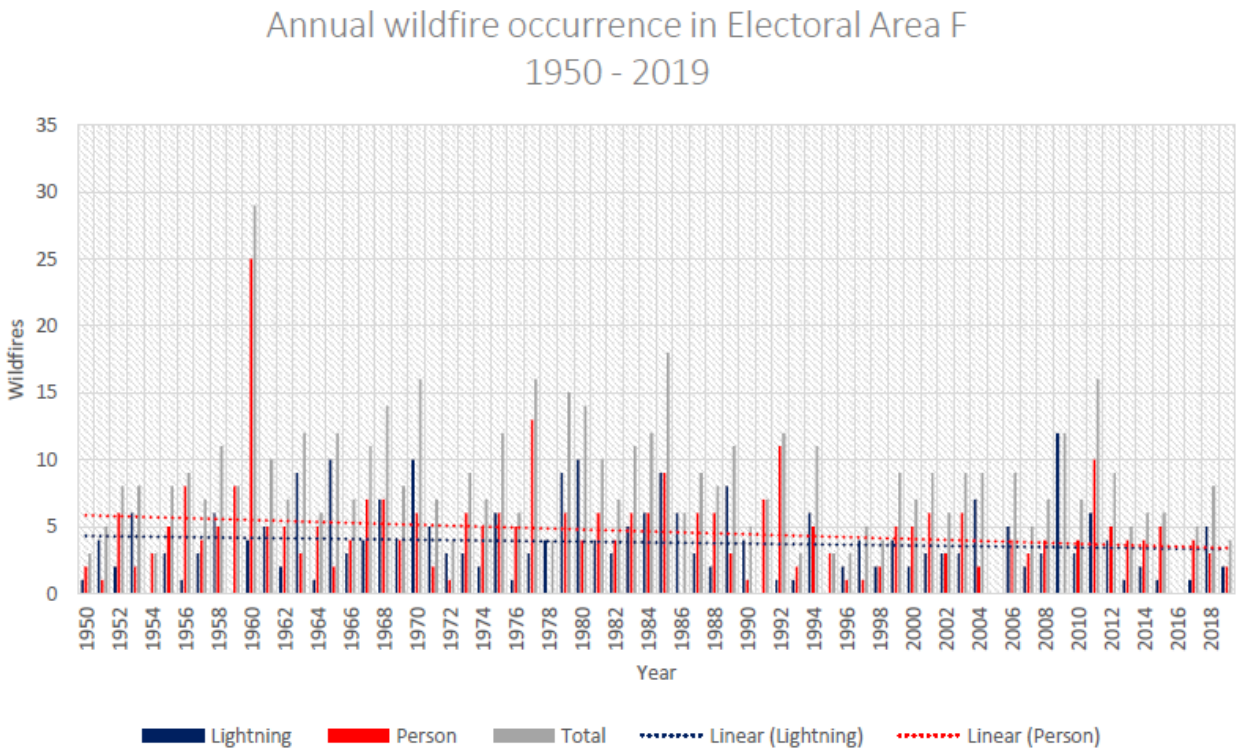

Figure 36 Annual wildfire occurrence in RDOS Electoral Area F from 1950 to 2019.

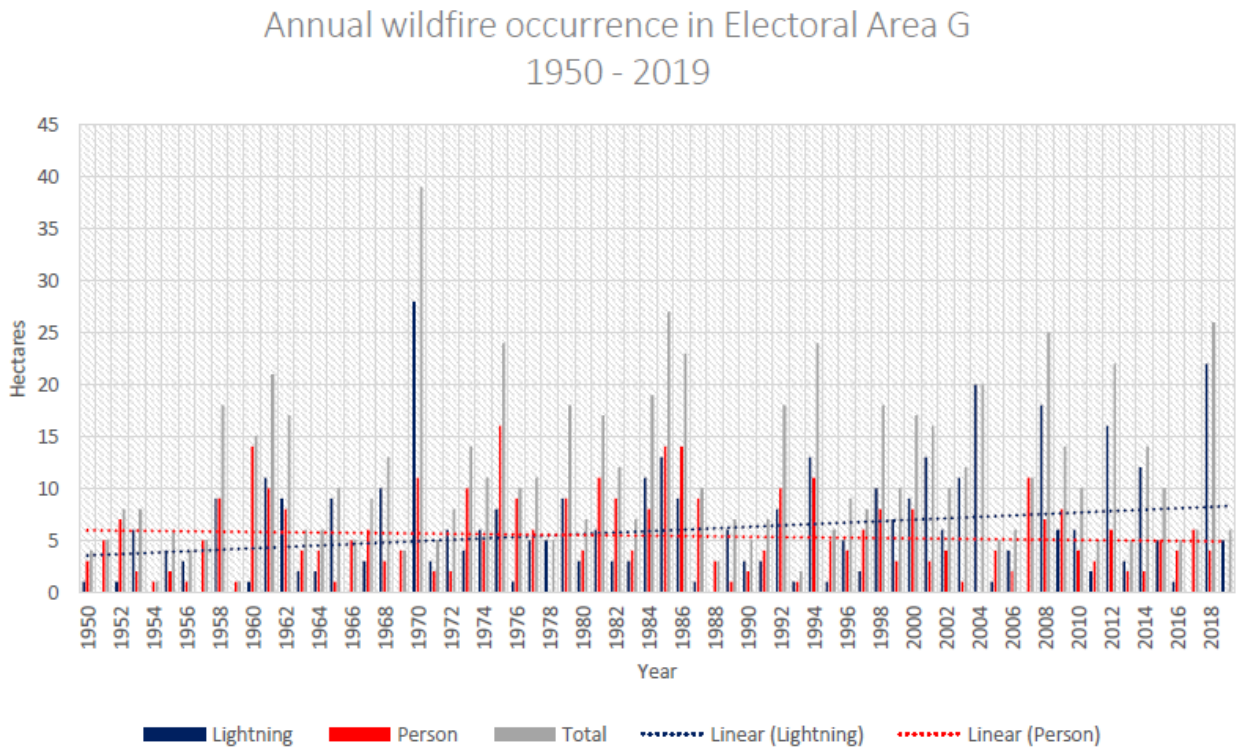

Figure 37 Annual wildfire occurrence in RDOS Electoral Area G from 1950 to 2019.

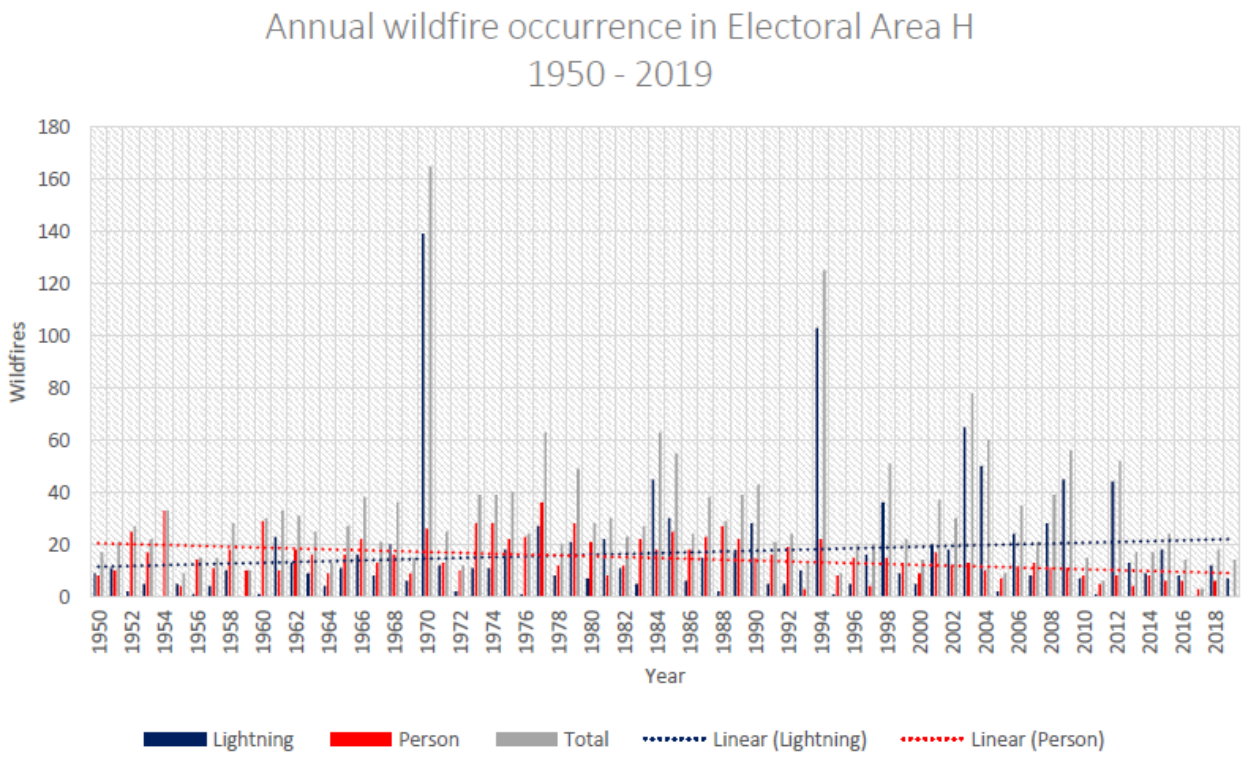

Figure 38 Annual wildfire occurrence in RDOS Electoral Area H from 1950 to 2019.

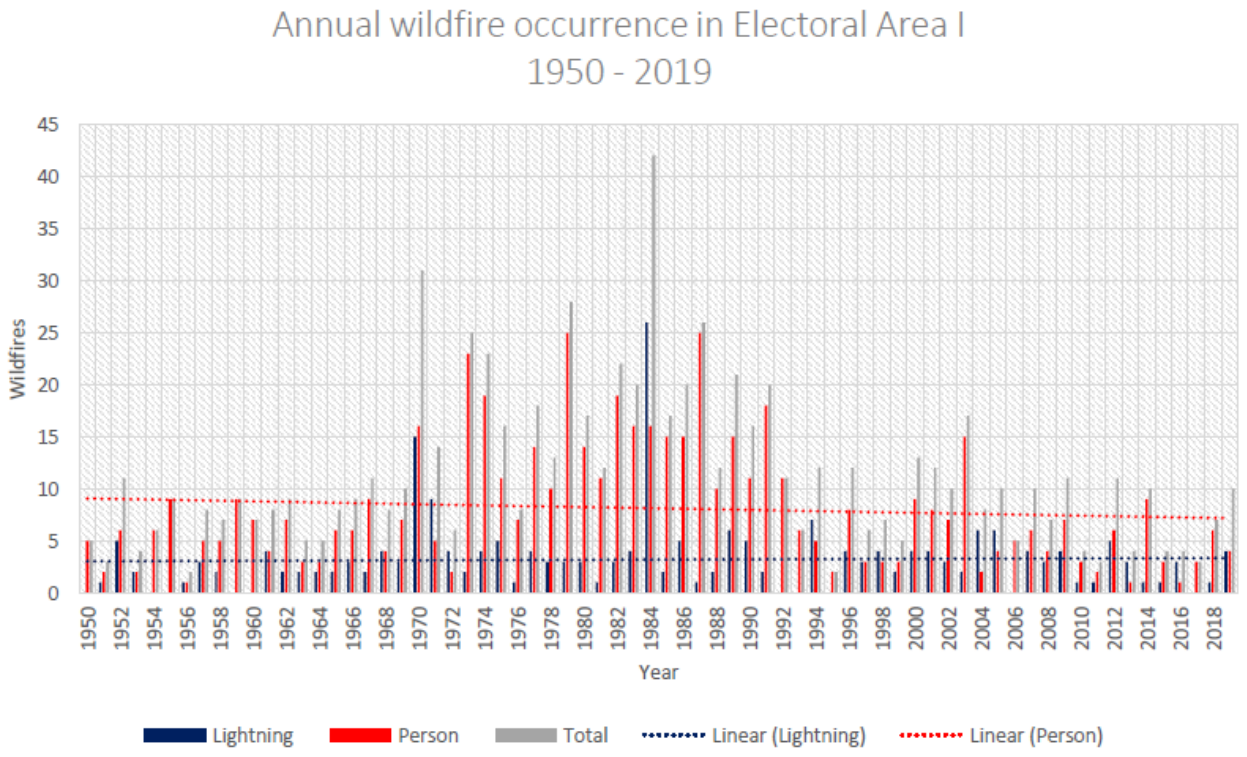

Figure 39 Annual wildfire occurrence in RDOS Electoral Area I from 1950 to 2019.

List of Abbreviations

ADT	Average daily traffic
AOI	Area of interest
BCEMS	BC Emergency Management System
BCWS	British Columbia Wildfire Service
BUI	Buildup Index
CAR	Community Assessment Report
CFB	Crown fraction burned
CFFDRS	Canadian Forest Fire Danger Rating System
CI	Critical infrastructure
CLWRR	Crown Land Wildfire Risk Reduction Program
CRI	Community Resiliency Investment
CWD	Coarse woody debris
CWPP	Community Wildfire Protection Plan
DC	Drought Code
DMC	Duff Moisture Code
DPA	Development permit area
EMBC	Emergency Management BC
EOC	Emergency Operations Centre
EPA	Emergency Program Act

ERRP	Emergency Response and Recovery Plan
FBP	Fire Behaviour Prediction System
FFMC	Fine Fuel Moisture Code
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
FNESS	First Nations' Emergency Services Society
FWI	Canadian Forest Fire Weather Index System *and* Fire Weather Index
GCM	Global Climate Model
HCA	Heritage Conservation Act
HFI	Head fire intensity
HRVA	Hazard, Risk and Vulnerability Analysis
ISI	Initial Spread Index
KFC	Kamloops Fire Centre
LRMP	Land and Resource Management Plan
MoTI	Ministry of Transportation and Infrastructure
NDT	Natural Disturbance Type
NGO	Non-governmental organization
OCP	Official Community Plan
OFC	Office of the Fire Commissioner
OGMA	Old-growth Management Area

PCIC	Pacific Climate Impacts Consortium
PM	Particulate matter
PPE	Personal protective equipment
PSTA	Provincial Strategic Threat Analysis
RCMP	Royal Canadian Mounted Police
RDOS	Regional District of Okanagan-Similkameen
RFP	Request for proposal
ROS	Rate of spread
RPF	Registered Professional Forester
SA	Service Area (MoTI)
SPU	Structure protection unit
SWPI	Strategic Wildfire Prevention Initiative
UBCM	Union of BC Municipalities
WUI	Wildland-urban interface