Community Wildfire Protection Plan
Regional District of North Okanagan

CWPP Update 2020

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Update 2020

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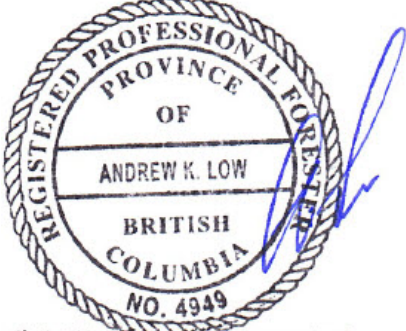2803 27th Street
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Heather Poulson	RPF 5136	Andrew K. Low	RPF 4949
Date Signed: June 29, 2022		Date Signed: June 27, 2022	
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Acknowledgments

Frontline Operations Group Ltd. acknowledges that work on this project was carried out on the traditional and unceded territories of the distinct and sovereign Syilx/Okanagan Nation, and Secwépemc Nation. Throughout this project, we were afforded the opportunity to experience the diversity and beauty of this land, and we reaffirm our support of the inherent jurisdiction of Syilx/Okanagan, and Secwépemc Nations to manage the land, and resources within it.

We extend considerable appreciation to Alastair Crick, Manager, Protective Services, of the RDNO for his support and guidance throughout this project. We are especially grateful for his patience and understanding as we completed the project during the corona virus pandemic.

Executive Summary

This Community Wildfire Protection Plan (CWPP) update is the second of two phases, covering wildland urban interface (WUI) areas that had not been covered by either the previous 2018 update, nor adjacent municipal plans. The Regional District of North Okanagan (RDNO) has long had a relationship with environmental disturbance, including wildland fire. The most recent 2021 fire season has affected RDNO residents through several evacuation alerts and orders, such as the July Keefer Lake Road, and Bunting Road wildfires. The 2021 fire season set the record in the Kamloops Fire Centre for the most hectares burned during a single wildfire season. Wildfire smoke levels can be intense when large-scale wildfires are burning near communities, affecting summer air quality and public health. Additionally, adverse effects of wildfires are compounded by climate change, and a history of fire exclusion within BC. To reframe the wildfire issues faced by the community, and to position the RDNO to access future prevention funding under the Community Resiliency Investment (CRI) program, Frontline Operations Group Ltd. was retained to undertake the phase two update to its Community Wildfire Protection Plan (CWPP), which was first completed in 2008.

In terms of the CRI program, a CWPP provides a starting point for wildfire prevention, and threat mitigation efforts for local governments. Mitigation recommendations are focused on public engagement and education, and fuel management.

An effective education and engagement strategy for reducing wildfire threat to private homes and properties, as well as publicly owned buildings and critical infrastructure, utilises the FireSmart program. FireSmart is focused on generating and sustaining community participation and ownership around taking action to reduce the likelihood of wildfire damage to private property and homes. The RDNO actively promotes FireSmart throughout the District.

Fuel management is carried out at a larger scale, which generally involves creating and maintaining interface and landscape fuel breaks on public land. Fuel treatments aim to modify or reduce wildland fuel characteristics or build-up to reduce potential wildfire intensity, and threat to adjacent values. Fuel management is a shared responsibility amongst local governments, First Nations, and the provincial government. When carried out in conjunction with FireSmart activities on nearby private land, fuel treatments significantly decrease the risk of home or structure ignition from an approaching wildfire.

As a partial indicator of potential future wildfire activity, a fire history analysis has been completed for the CWPP area of interest (AOI), with a 2 km buffer. The wildfire occurrence rate is variable, but the applied trendline implies that wildfire numbers near residential areas are gradually declining. The number of person-caused wildfires is decreasing more so than lightning-caused. The annual area burned has increased in the past several years compared with previous decades. An analysis of five established BC Wildfire Service (BCWS) fire weather stations in the surrounding region shows an overall increasing trend in annual Fire Danger Class 4 and 5 days, as well as the seasonal severity rating. Curiously, the Mabel Lake 2 weather station data illustrates a declining trend in annual Fire Danger Class 4 and 5 days.

Geospatial analysis of provincial fuel type layers, and the provincial strategic threat analysis (PSTA) outputs further characterize the wildfire risks that the RDNO continues to face. Although parts of the RDNO are relatively well-protected by orchards, agricultural fields, or large lakes, the WUI contains vast forested areas, and remains vulnerable to wildfire damage. Continued emphasis should be placed on empowering private property owners and residents to manage their fuel hazards. This includes educating the community on how to manage both landscaping and structure characteristics to make their homes and/or structures less prone to ignition during a wildfire.

The CWPP process included completing fieldwork throughout the AOI, largely focused on local WUI wildfire threat assessments on municipal and crown land. Assessment locations were determined based on areas where geospatial analysis and fire behaviour modelling were classified as moderate or higher. Threat assessment results provided the basis for recommending eight fuel management treatments – five interface treatments and three landscape treatments totalling 332.7 ha within the AOI (see Table 22). The Sugar Lake 2-Mile proposed treatment area should extend beyond the AOI by an additional 3.6 ha, which is depicted in Figure 24.

Much of the proposed WUI wildfire threat assessment locations occurred along public right of ways, or in public land adjacent to forested private property. Fuel breaks were designed in areas that made sense for treatment; however, the majority of the AOI would benefit from community FireSmart participation. Thirteen locations have been identified for FireSmart projects, of which twelve would be good candidates for FireSmart Canada recognition, with RDNO support.

The RDNO will continue to face wildfire pressures, which will likely be exacerbated by climate change. Maintaining a proactive focus on wildfire prevention and mitigation efforts, and continuing to build upon current progress levels, should enable the community to continually find ways to grow and thrive in an active wildfire environment.

A summary table of the 15 CWPP recommendations is provided on the following page.

Summary of CWPP Recommendations

Section 5: Risk Management and Mitigation Factors

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 1 – Risk Management and Mitigation Factors	Conduct fuel hazard mitigation on municipal land. Priority: High	Apply for funding to prescribe and treat the 5.7 ha of municipal ownership class land summarized in Table 22 surrounding Cherryville Elementary School and Hanson Park.	RDNO, with UBCM CRI funding support This is recommendation 1 of 2 for the Cherryville Elementary School FTU.
No. 2 – Risk Management and Mitigation Factors	Educate Cherryville residents and visitors about fuel hazard mitigation and FireSmart Priority: Moderate - High	In conjunction with recommendation No. 1, or after fuel treatment is completed, design educational signs, and erect next to the roadside picnic tables across from the Cherryville Elementary School to further enhance the wildfire mitigation work, and encourage residents to FireSmart their own properties.	RDNO, with UBCM CRI funding support, if possible This is recommendation 2 of 2 for the Cherryville Elementary School FTU.
No. 3 – Risk Management and Mitigation Factors	Support fuel hazard mitigation on crown lands. Priority: High	Support FLNRORD to develop prescriptions to undertake wildfire risk reduction treatments on 327.0 ha + 3.6 ha = 330.6 ha of crown land summarized in Table 22. Treatments include interface and landscape fuel breaks.	FLNRORD, with funding from the Crown Land Wildfire Risk Reduction (CLWRR) program RDNO to engage and partner with FLNRORD for completing the work
No. 4 – Risk Management and Mitigation Factors	Support use of prescribed fire in the region. Priority: Moderate	Support FLNRORD, First Nations, and any agencies that are using prescribed fire to manage fuel treatment units, increased fuel loads, and enhance ecological areas. Amplify public engagement that supports prescribed fire use. The use of prescribed fire often results in less smoke output compared with similar areas burning from an unplanned wildfire.	RDNO, and regional partners This recommendation is in alignment with the 2018 CWPP update and should be completed for the RDNO entirety.

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 5 – Risk Management and Mitigation Factors	Establish a partnership between RDNO and MoTI to address wildland fuel hazard concerns along Provincial highways and on MoTI owned rights of way. Priority: Moderate	Develop an agreement to facilitate ongoing and shared interest in wildland fuel management and roadside vegetation control, including identifying, monitoring, and mitigating roadside wildland fuel hazards. Establish best practices for controlling roadside vegetation in the RDNO, that aim to limit hazardous fuel during the fire season.	RDNO and MoTI, with support from CLWRR and/or UBCM CRI funding
No. 6 – Risk Management and Mitigation Factors	Maintain the Wildfire Hazard Development Permit Area for Area F. Priority: High	Maintain the Wildfire Hazard Development Permit Area (DPA) for the RDNO Area F Official Community Plan (OCP). When the OCP is amended or updated, ensure that requirements and guidelines complement current FireSmart principles. Consider requiring specific FireSmart exterior finishing, and landscaping for new developments within the DPA.	RDNO This recommendation is to ensure that wildfire hazard mitigation planning is current in bylaws and new developments.
No. 7 – Risk Management and Mitigation Factors	Develop a Wildfire Hazard Development Permit Area for Area D & E. Priority: Moderate - High	Develop a Wildfire Hazard DPA for the RDNO Area D & E OCP. When the OCP is amended or updated, establish the Wildfire Hazard DPA in alignment with the Area F OCP. Ensure that requirements and guidelines complement current FireSmart principles. Consider requiring specific FireSmart exterior finishing, and landscaping for new developments within the DPA.	RDNO This recommendation is to ensure that wildfire hazard mitigation planning is current in bylaws and new developments.

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 8 – Risk Management and Mitigation Factors	Conduct a FireSmart Assessment and mitigation work for Mabel Lake Community Hall at 111 Shuswap Falls Rd. Priority: High	Pursue funding for a community asset FireSmart project for a municipal-owned building and property. Support completion of the FireSmart Assessment and mitigation work. Educate the community throughout the project and provide FireSmart information to the public upon completion. Maintain the building and grounds to FireSmart standards.	RDNO, with UBCM CRI funding support This recommendation is for the RDNO to create a FireSmart demonstration area for the rural Lumby community.
No. 9 – Risk Management and Mitigation Factors	Conduct FireSmart Community Recognition Projects Priority: High	Support new FireSmart Community Recognition projects for neighbourhoods in Areas D, E, & F. A list of recommended neighbourhoods is listed in Table 24. Over a 6-year period, complete 2-3 community recognition projects per year. Utilize funding from the FireSmart Rebate Program of up to $500 per property to encourage residents to participate. Provide annual support to neighbourhoods after they achieve FireSmart Canada recognition.	RDNO, with UBCM CRI funding support
No. 10 – Risk Management and Mitigation Factors	Share the CWPP and related deliverables with the public, First Nations, adjacent local governments, industry, and relevant NGOs. Priority: Moderate	Establish a wildfire safety and hazard reduction page on the RDNO website to share the CWPP, highlight the FireSmart program, and recommend simple actions for homeowners to reduce ignitability of their homes. Engage in public education information sessions throughout the community to present the CWPP, and share wildfire management and FireSmart information.	RDNO This recommendation is in alignment with the 2018 CWPP update and should be completed for the RDNO entirety.

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 11 – Risk Management and Mitigation Factors	Develop a communication strategy for wildfire risk and mitigation measures. Priority: Moderate	Prepare a written strategy that outlines how wildfire risks and mitigation measures will be communicated with the community. Include specific strategies to improve wildfire education. Outline how and when information about what local mitigation measures are being undertaken within and by the community will be communicated. Continue to host Wildfire or FireSmart Public Education Workshops, or Information Sessions throughout the RDNO prior to and during the fire season. Promote WUI wildfire threat reduction as a mutually beneficial strategy between local governments and private property owners, where all parties take responsibility for reducing wildfire hazard, and increasing wildfire resiliency for the community.	RDNO This recommendation is specific to community communication and education.

Section 6: Wildfire Response

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 12 - Wildfire Response	Develop a pre-attack wildfire response plan to guide wildfire suppression strategies and tactics. Priority: High	Also known as a pre-suppression plan, develop a detailed map that identifies staging areas, water sources, trail heads, drop points, access, other potential incident facilities and landmarks, etc.. Consider identifying suitable heli pads. Consider developing the response plan jointly with BCWS and adjacent response partners to facilitate firefighting assistance.	RDNO and BCWS This recommendation is in alignment with the 2018 CWPP update and should be completed for the RDNO entirety.

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 13 - Wildfire Response	Increase wildfire training for volunteer firefighters. Priority: Moderate - High	Recommend working with the BCWS to provide the following courses to local volunteer firefighters: • Intermediate Wildland Fire Behaviour • Wildfire Scene Preservation for First Responders • Wildfire Origin and Cause Investigation • Ignition operations and prescribed burn training • Air operations and tactics training	RDNO, with support from BCWS
No. 14 - Wildfire Response	Pursue a joint wildland tabletop exercise with response partners. Priority: Moderate	In conjunction with the Fire Departments of B.X./Swan Lake, Lumby & District, Silver Star, Armstrong / Spallumcheen, Coldstream, Enderby, Lavington, Vernon Fire Rescue, Ranchero-Deep Creek, BCWS, and other interested response partners, hold a joint wildfire tabletop exercise to practice interagency coordination and cooperation. Recommended participants include command and general staff positions.	RDNO, BCWS, and municipal / regional partners with UBCM CRI funding support
No. 15 - Wildfire Response	Acquire Type 2 Structure Protection Units for Lumby and Enderby. Priority: Moderate	Consider acquiring Type 2 Structure Protection Units (SPUs) for Lumby and Enderby to complement suppression capabilities. Offers a tactical advantage to local fire departments. During the fire season, can be provided to BCWS for a fee to help supplement fire department budgets.	RDNO This recommendation is in alignment with the 2018 CWPP update and could be completed for the RDNO entirety.

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SECTION 1: Introduction

Community Wildfire Protection Plans (CWPPs) were first introduced by the BC government in 2004 to address an important recommendation outlined in the Firestorm 2003 Provincial Review (Filmon, Leitch, & Sproul, 2004). The Union of BC Municipalities (UBCM) is a key player responsible for administering funding to complete CWPPs. Since 2004, funding had been provided through the Strategic Wildfire Prevention Initiative (SWPI); however, in 2018 the Community Resiliency Investment (CRI) program was introduced, which provides current funding to local governments and First Nations applicants. This CWPP has been prepared in accordance with the 2020 CRI Program and Application Guide (UBCM, 2019). Going forward, this CWPP should transition to the new 2020 Community Wildfire Resiliency Plan (CWRP) or similar plan, as specified by future CRI funding intakes.

The following sub-sections introduce the overall purpose and goals of this CWPP, as well as outline the CWPP planning process.

1.1 Purpose

The purpose of a CWPP is to deliver a summary of wildfire mitigation actions for the community. The summary is prepared after a thorough examination of multiple factors affecting overall wildfire threat to the community. These include describing and analysing the fire environment, in conjunction with identifying wildfire risks, potential consequences if a wildfire were to occur, and methods of reducing the wildfire risk. The CWPP provides strategic and operational recommendations to strengthen wildfire resiliency throughout the community.

Key goals are to identify the values at risk, including human life, property, and infrastructure. In order to mitigate the wildfire threat to identified values, the CWPP includes mitigation recommendations, and an action plan for implementation.

The CWPP planning process is intended to provide the community with a detailed framework for implementing specific actions that will:

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

1.2 CWPP Planning Process

The Regional District of North Okanagan (RDNO) has previously completed the CWPP planning process, as well as a 2018 CWPP update (Davies Wildfire Management Inc., January 2019). This 2020 CWPP update covers RDNO areas to the north and east of the previously updated areas.

Frontline Operations Group Ltd. (Frontline) was retained as the consulting firm to conduct the 2020 CWPP update. As forest professionals qualified in all aspects of wildland fire management, Andrew Low, RPF supervised the field assessments, analysis and report compilation, while John Davies, RPF provided input into treatment recommendations and was available for planning refinement as needed. Heather Poulson, RPF conducted the field assessments, analysis, treatment recommendation design and report compilation. Consultations were conducted through the RDNO Manager of Protective Services, Alastair Crick.

SECTION 2: Local Area Description

This CWPP has been carried out within rural Areas of the RDNO, adjacent to previously completed CWPPs for the District. The RDNO was incorporated in 1965, with economic drivers of agriculture, forestry, and tourism (RDNO, 2021a). The six municipalities of Armstrong, Coldstream, Enderby, Lumby, Spallumcheen, and Vernon are located within the RDNO boundary, where local governments work with the RDNO in partnership. Outside of the municipal boundaries, the RDNO is divided into five Electoral Areas (B, C, D, E, and F).

The local area of the RDNO is overlapped by the unceded traditional territories of the Sylix/Okanagan Nation and the Secwépemc Nation (Native Land Digital, 2021).

The following subsections provide detailed descriptions for Areas D, E, and F, where they are included within the CWPP Area of Interest (AOI), community information, previous wildfires, community engagement, and links to relevant plans and policies that provide valuable information to reduce the threat of wildfires.

2.1 CWPP Area of Interest

The AOI describes the study area, where most of the human population and other values at risk are located. UBCM provides guidance for defining the AOI, which varies depending on community density. This CWPP utilized a regional approach to defining the AOI.

Within the RDNO boundary, there are several existing CWPPs. To avoid duplication, the AOI was selected to include portions of Areas D, E, and F, with the previous CWPP AOIs clipped out, or directly adjacent to one another. The AOI was established by using a 1km buffered extent of the wildland urban interface (WUI), and manually edited to cover the estimated area written into the UBCM CRI application worksheet. Frontline worked with the RDNO to ensure appropriate locations were included in the AOI. Table 1 (below) outlines the AOI breakdown by Area.

Table 1: AOI breakdown by RDNO Electoral Area

Electoral Area	Name	AOI Area (ha)
Area D	Rural Lumby	45,094
Area E	Cherryville	29,283
Area F	Rural Enderby	22,569
Total AOI Area (ha):		*96,946*

Refer to Map 1 to see the two separate polygons comprising this CWPP AOI. Area F is located in the northern part of the RDNO, with some portions of the AOI adjacent to the Columbia-Shuswap Regional District. Areas D and E are located in the central part of the RDNO.

2.2 Community Description

The CWPP plan area is both ecologically and economically diverse. The AOI is split between the hot and dry Okanagan Valley and the cool, wet Monashee Mountains. The diverse ecology gives way to primary land uses of agriculture and forestry, as well as vast tourism and recreational opportunities. This sub-section has been further divided into descriptions of governance and administration (2.2.1), infrastructure and services (2.2.2), economic drivers

(2.2.3), land ownership (2.2.4), firefighting jurisdiction (2.2.5), and existing evacuation and egress routes (2.2.6).

2.2.1 Governance and Administration

The RDNO delivers local government services to the rural residents living within this CWPP. This includes community planning for Rural Lumby, Cherryville, and Rural Enderby (Areas D, E, F). In addition, the RDNO provides services to the entire North Okanagan region, as well as sub-regional services to various combinations of municipalities and electoral areas (RDNO, 2021a).

As with other regional districts in BC, RDNO is governed by a Board of Electoral Area Directors and Municipal Directors. There are 14 directors on the RDNO Board, and a selected chairperson responsible for establishing various committees (RDNO, 2021a). The RDNO Board of Directors and employees access internal services through the administration department (RDNO, 2021b). Administration includes the following:

- Corporate Services
- Electoral Area Administration
- Finance
- Human Resources
- Information Services / GIS
- Information Requests, including requests under the Freedom of Information and Protection of Privacy Act
- Elections, Referenda & Alternate Approvals

Overall, the gross area of non-fuels present within the CWPP AOI is approximately 12,870 ha, or 13% of the 96,946 ha included within the scope of this plan (Table 2). Water adds an additional 3,190 ha, or 3% to the non-fuel component. A breakdown for each electoral area is provided in Table 3. with Area F containing the highest percentages of non-fuel within the AOI.

Within Area F, Splatsin First Nation is located in Indian Reserve (IR) 2 Enderby on land south and east of Enderby city (Splatsin, 2021). They are governed by their own system on federal land; therefore, assessments and recommendations resulting from this CWPP process did not include IR 2. Most of IR 2 is included in the AOI, encompassing approximately 2,203 ha, or 2% of the total plan area.

Table 2: Overall area and percent of fuels/non-fuels present within the AOI

Area Type	Area (ha)	%
Community/Non-fuel	12,870	13%
Fuel	80,885	83%
Water	3,190	3%
Total	**96,946**	**100%**

Table 3: Area and percent of fuels/non-fuels within each Electoral Area

RDNO Electoral Area	Area Type	Area (ha)	%
Area D	Community/Non-fuel	4,336	10%
	Fuel	39,259	87%
	Water	1,499	3%
	Total	**45,094**	**100%**
Area E	Community/Non-fuel	2,542	9%
	Fuel	26,190	89%
	Water	551	2%
	Total	**29,283**	**100%**
Area F	Community/Non-fuel	5,993	27%
	Fuel	15,436	68%
	Water	1,140	5%
	Total	**22,569**	**100%**

2.2.2 Infrastructure and Services

The RDNO corporate office is located in the municipality of Coldstream, where operations are based. Beyond Coldstream, Areas D, E, and F are characterised by vast, open spaces, with rural populations much lower than in larger centres. Funding for public infrastructure tends to be lower than neighbouring urban centers, which impacts the RDNO's ability to develop and maintain public infrastructure (RDNO, 2011, 2016). Below is a small summary of key public infrastructure located within the CWPP AOI.

In Area E, the RDNO (2021b) operate and maintain the Cherryville & Area Transfer Station. In Area F, the RDNO (2016) operate and maintain two water utilities (Grindrod, and Gunter – Ellison). There are a few community parks located throughout the AOI. Streetlight services are available in parts of Areas D and F (RDNO, 2021b).

Examples of key services provided to rural communities within and by the RDNO (2021a) include:

- Building Inspection
- Planning and Development services
- Parks, Recreation and Culture programs and facilities
- Greater Vernon Water
- Animal Control
- Regional Transit
- Fire Protection
- Invasive Plant Control
- Solid Waste Management
- Recycling & Waste Reduction
- Victims Assistance

BC Hydro provides electricity supply to residents within the CWPP AOI. Fortis BC provides natural gas supply to residents near Lumby and Enderby.

Hospital and health centre services are provided in nearby Lumby, Enderby, Armstrong, and Vernon.

In Areas D and D, the major transportation corridor is Highway 6, with secondary roads to access rural properties and recreational areas.

In Area F, the major transportation corridors are Highways 97A and 97B, with a secondary road network to access rural properties and recreational areas.

2.2.3 Economic Drivers

Economic drivers within Areas D, E, and F were evaluated based on the 2016 Census data (Statistics Canada, 2017abc). It was not possible to extract data for the AOI, so trends are presented for the entirety of each electoral area. Census data was combined for all three rural Areas, indicating that the top five industries for those locations employed 59% of the workforce, including agriculture, forestry, fishing and hunting (18%), manufacturing (13%), construction (12%), retail trade (11%), and health care and social assistance (6%). The following Figures provide breakdowns for each individual Area, which follow similar economic trends.

Figure 1 presents the 2016 Census data for Area D. The top five industries employed 63% of the workforce, including agriculture, forestry, fishing and hunting (21%), construction (13%), retail trade (11%), manufacturing (11%), and health care and social assistance (6%).

Figure 2 presents the 2016 Census data for Area E. The top five industries employed 55% of the workforce, including construction (14%), agriculture, forestry, fishing and hunting (13%), retail trade (12%), manufacturing (8%), and accommodation and food services (7%).

Figure 3 presents the 2016 Census data for Area F. The top five industries employed 58% of the workforce, including agriculture, forestry, fishing and hunting (17%), manufacturing (15%), construction (11%), retail trade (10%), and health care and social assistance (6%). This is in alignment with the Area E Official Community Plan, which states that the key economic driver is agriculture, made of predominantly beef and dairy farming, alongside many field crops and small diversified farms (RDNO, 2016).
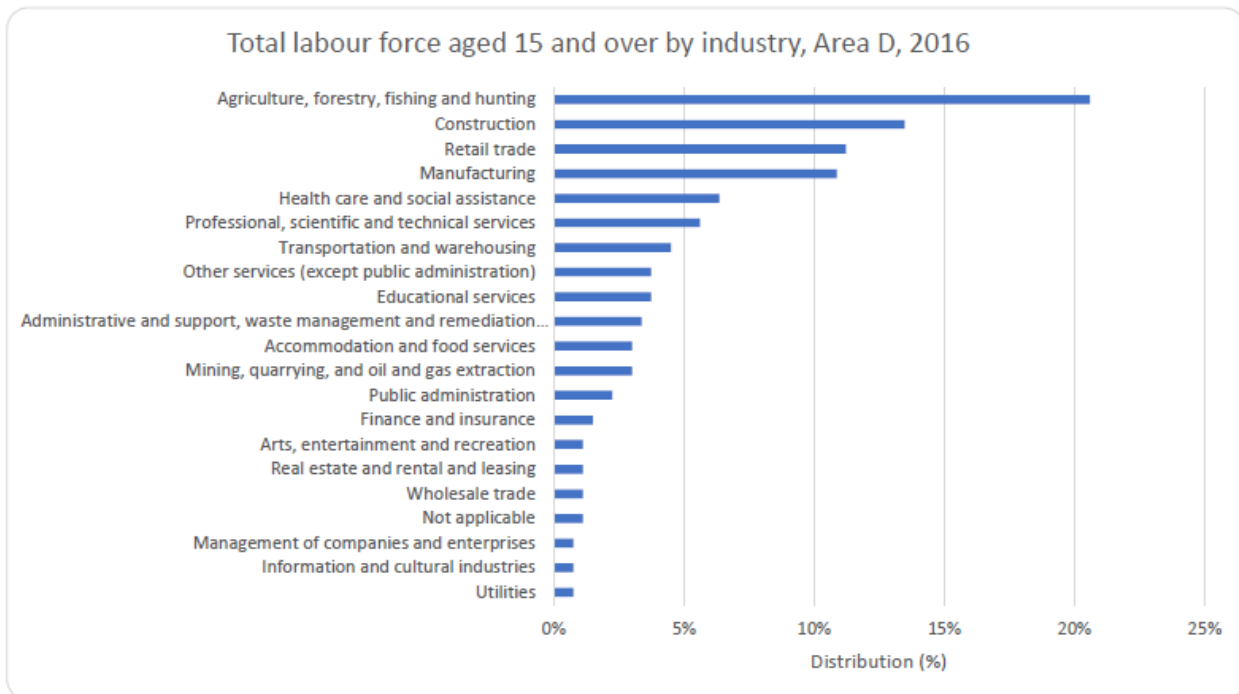
Figure 1: 2016 Employment statistics for RDNO Electoral Area D (Statistics Canada, 2017a)
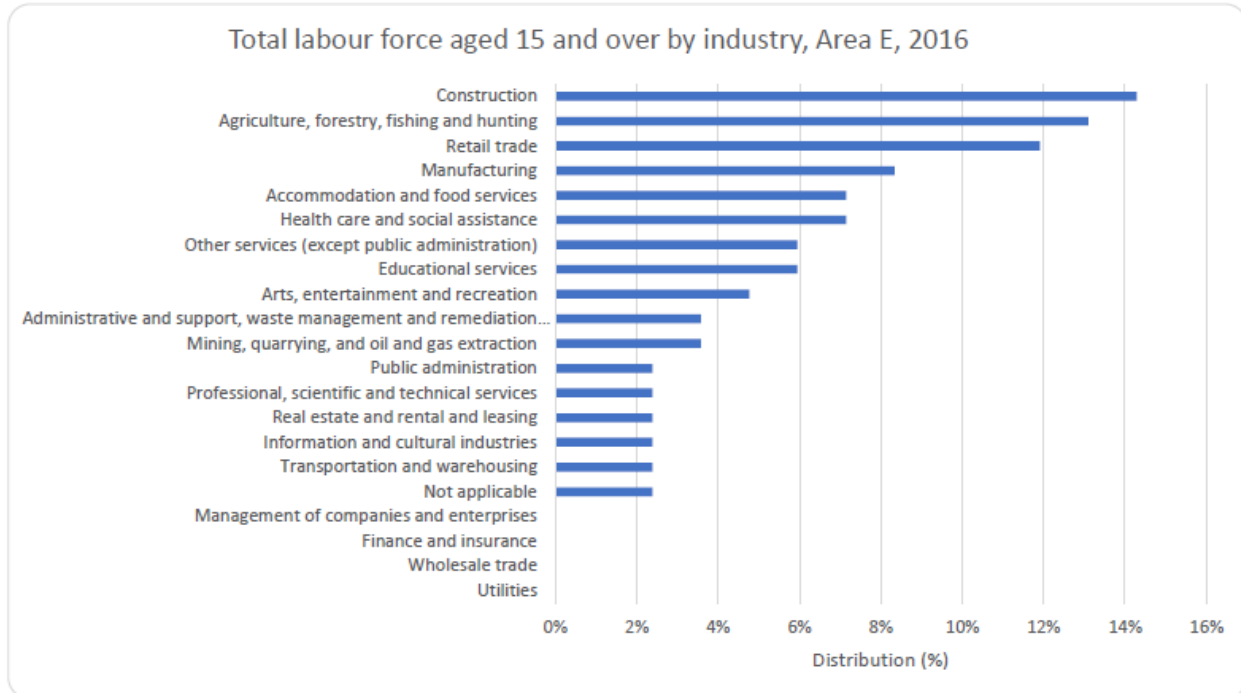
Figure 2: 2016 Employment statistics for RDNO Electoral Area E (Statistics Canada, 2017b)
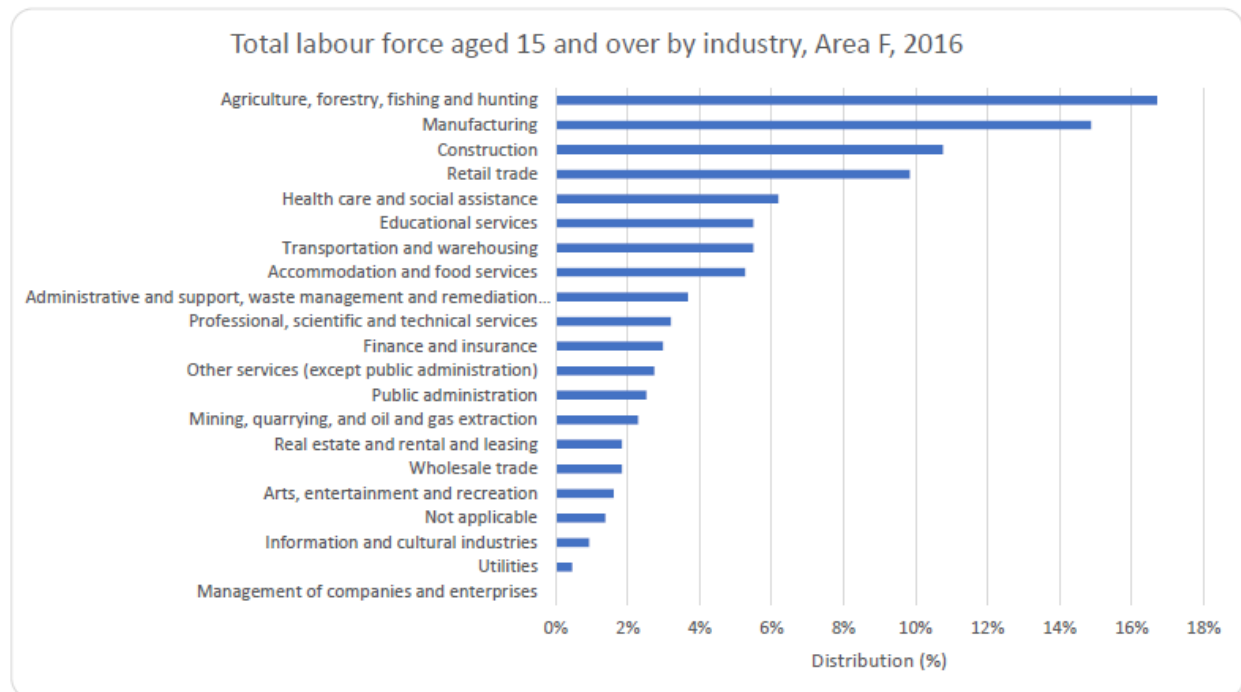
Figure 3: 2016 Employment statistics for RDNO Electoral Area F (Statistics Canada, 2017c)

2.2.4 Land Ownership

Within the AOI, crown land is the main ownership type, covering over 48% of the land base (Table 4). When crown provincial, crown agency, and federal land is tallied, the overall crown ownership covers just over half of the AOI at 51%. Private land covers 33%, while municipal land covers just 0.1% of the AOI. Table 5 provides a more detailed breakdown of land ownership by Areas D, E, and F.

Delineation of ownership is important, because it affects the ability to obtain funding to carry out fuel management activities. CRI and FES funding is available for undertaking projects on public land.

Table 4: Land ownership types within the AOI

Land Ownership Type	Area (ha)	%
Crown Land	46,273.2	48%
Private	32,231.8	33%
None	12,311.4	13%
Crown Provincial	3,343.8	3%
Indian Reserve	2,203.4	2%
Crown Agency	316.5	0.3%
Unknown	130.8	0.1%
Municipal	100.6	0.1%
Federal	32.5	0.03%
Mixed Ownership	2.0	0.002%
Total	**96,946.0**	**100%**

Table 5: Land ownership types by RDNO Areas

RDNO Electoral Area	Land Ownership Type	Area (ha)
Area D	Crown Land	21,151.6
	Private	15,130.5
	None	6,992.7
	Crown Provincial	1,589.9
	Crown Agency	130.4
	Unknown	93.1
	Municipal	5.3
	Federal	0.7
	Total	**45,094.2**
Area E	Crown Land	17,172.7
	Private	7,262.1
	None	3,199.7
	Crown Provincial	1,457.7
	Crown Agency	180.5
	Municipal	9.5
	Unknown	0.9
	Total	**29,283.2**
Area F	Private	9,839.2
	Crown Land	7,948.9
	Indian Reserve	2,203.4
	None	2,118.9
	Crown Provincial	296.1
	Municipal	85.8
	Unknown	36.8
	Federal	31.8
	Crown Agency	5.6
	Mixed Ownership	2.0
	Total	**22,568.5**
	AOI Grand Total	**96,946.0**

2.2.5 Firefighting Jurisdiction

The following RDNO fire departments are available to respond within the fire protection boundaries in Area D (Rural Lumby/Area D), and Area F (Shuswap River, Twin Lakes/Grandview Bench, and Enderby FP – Splatsin) (RDNO, 2021b):

- B.X./Swan Lake Fire-Rescue, Vernon
- Lumby and District Volunteer Fire Department, Lumby
- Silver Star Fire Department, Vernon

The Enderby and District Volunteer Fire Department provides fire protection to parts of Area F that are located outside the municipal boundaries.

The Ranchero-Deep Creek Volunteer Fire Department also provides fire protection to parts of Area F, near the north and west AOI boundaries (Twin Lakes/Grandview Bench). The station is located just outside the RDNO near Waby Lake, in the Columbia Shuswap Regional District.

Area E does not currently have established fire protection boundaries.

2.2.6 Existing Evacuation and Egress Routes

When this CWPP was prepared, there were no existing evacuation and egress routes planned within the AOI. When wildfires occur, the RDNO works with agencies such as BC Wildfire Service (BCWS), the Ministry of Transportation, the Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (FLNRORD), the RCMP, and Search and Rescue. Evacuation and egress routes are determined based on fire behaviour, then communicated to the public through various media outlets, and sometimes in person.

Splatsin First Nation have compiled separate evacuation plans for five established Zones, which are available from their webpage (Splatsin, 2021).

2.3 Past Wildfires, Evacuations, and Impacts

The intent of this sub-section is to describe past significant wildfires and the impact on the community. Notwithstanding, it is worth noting that 2021 has been significantly warm and dry, resulting in several wildfires within the RDNO, some of which have occurred near or within the AOI. The 2021 evacuation alerts, orders, and locations relevant to this CWPP are summarised below:

- Alert: Winnifred Creek (July 20, 2021) – Keefer Lake Road wildfire – SE of Cherryville, just outside the AOI
- Order: 10,000-17,000 blocks of Mabel Lake FSR (July 20, 2021) – Bunting Road wildfire – North of Mabel Lake Provincial Park, just outside the AOI

Throughout history, the North Okanagan Region has regularly experienced wildfires as a natural disturbance agent. More recently, wildfires have occurred in the WUI of Vernon, where Adventure Bay and Predator Ridge received evacuation orders and alerts, respectively. Wildfire seasons of 2017 and 2018 saw numerous life-threatening fires throughout the province, and the RDNO was able to offer refuge for wildfire evacuees.

In 2018, there were 27 wildfires burning between Mabel Lake and Sugar Lake, known as the Monashee Complex in the eastern RDNO. Of note, were Woodward Creek (216 ha), Mabel Creek (1,370 ha), Sugar Mountain (394 ha), and Harris Creek (838 ha). These fires created sustained smoke exposure, area closures and evacuation alerts. Although the 2017 wildfire season set a provincial record for the most hectares burned during a single wildfire season, the 2018 wildfire season surpassed that record, setting the current record for BC. Of the 1.8 million hectares burned in 2018, approximately 3,650 ha were consumed by wildfires within the RDNO. In 2019 and 2020, the wildfire seasons were relatively quiet within the RDNO, where a total of 37 wildfires consumed 42.5 ha. Table 6 presents a summary of the more significant wildfires within the CWPP AOI in recent years (note that 2021 is not included in Table 6).

Many regions of BC have been subject to extensive loss of homes, due to wildfire, but the RDNO has managed to evade similar outcomes. A detailed fire history analysis, including fire occurrence and annual area burned within the AOI is provided in Section 4.2.1.

Table 6: Significant wildfires within the AOI in recent years

Electoral Area	Date	Fire Number	Fire Name	Size (ha)	Cause
Area E	2020-06-30	K40284	Olive FSR	0.4	Person
Area F	2020-05-21	K40156	Enderby Mabel Oxbow	3.6	Person
Area D	2019-05-11	K40438	Bobby Burns Road	2.2	Lightning
Area D	2018-07-11	K41809	Proctor Rd	20.0	Lightning
Area D	2018-07-11	K41772	Spallumcheen Forest	2.8	Lightning
Area D & E	2018-07-30	K42705	Woodward Creek	215.5	Lightning
Area F	2018-03-31	K40117	Rosemond FSR	2.2	Person
Area F	2016-08-30	K30209	Twin Lakes	1.9	Person

2.4 Current Community Engagement

The intent of this sub-section is to summarize the current level of wildfire prevention measures in the community, including previous CWPPs, local government planning, fuel treatments or FireSmart activities, and the identification of community organizations that are participating in activities to reduce the threat of wildfires.

This 2020 CWPP update complements several existing CWPPs within the RDNO boundaries to provide comprehensive planning for WUI of municipalities and electoral areas. Separate CWPPs were prepared for Armstrong and Spallumcheen in an unknown year, Splatsin First Nation in 2009, Vernon in 2014, Coldstream and Lumby in 2016, and Enderby and RDNO Phase One in 2018. The previous RDNO CWPP was prepared in 2008. Fuel treatment prescriptions and FireSmart activities are ongoing throughout the RDNO.

The RDNO actively engages with local communities about FireSmart, wildfire prevention measures, and general emergency management through their website, their Facebook page, various media websites, and through virtual or in person meetings and events. Information is shared most often during the wildfire season. The key communities within the CWPP AOI are located in rural Enderby, rural Lumby, and Cherryville. Community engagement activities have been regularly provided by the RDNO, often in collaboration with Frontline. Examples include in person FireSmart information sessions, in person FireSmart workshops, a FireSmart photo contest, promoting the homeowner grant provided by FireSmart Canada, providing general preparedness information on the RDNO Emergency Management webpage, and posting regular media releases, often with links to more detailed information.

The three main fire departments providing fire protection within in the AOI are the Lumby and District Volunteer Fire Department, the Enderby and District Volunteer Fire Department, and the Ranchero-Deep Creek Volunteer Fire Department. All are active participants and leaders of FireSmart principles in their local areas. For example, the Lumby and District Volunteer Fire Department regularly holds open houses, FireSmart information sessions and other public education and safety events for their communities. The RDNO Facebook page promotes the Lumby and District Volunteer Fire Department, and well as wildfire preparedness and response activities, and evacuation alerts and orders. Both the Enderby and District Volunteer Fire Department, and the Ranchero-Deep Creek Volunteer Fire Department have their own Facebook pages, where they regularly post information about wildfire preparedness, including FireSmart, wildfire response, as well as evacuation alerts and orders.

Cherryville does not have its own fire department; however, the Cherry Ridge Management Committee (2021) has produced the "Cherryville Fire Control Guide & List of Volunteers" that outlines emergency action for fires within Cherryville, including names and contact information

for fire wardens, water trucks, loggers, and others with equipment. The Cherryville facebook page regularly posts information about wildfire preparedness, including FireSmart, wildfire response, as well as evacuation alerts and orders.

Splatsin First Nation promote FireSmart, and other wildfire preparedness activities on both their webpage, and Facebook pages (Splatsin, 2021). Splastin First Nation provide ample resources to help residents be ready in the event of a wildfire.

2.5 Linkages to Other Plans and Polices

The intent of this sub-section is to identify sources and linkages to other documents to minimize duplication, while identifying other plans or legal requirements that are relevant to the CWPP planning process. It also discusses relevant objectives, strategies and polices that influence CWPP development.

2.5.1 Local Authority Emergency Plan

As per the Emergency Program Act, all local governments are required to prepare local emergency plans that include provisions for preparedness, response and recovery from wildfire. The RDNO local emergency plan includes the following information:

- emergency management organization;
- assignment of responsibilities;
- list of assisting/cooperating agencies;
- emergency notification procedures;
- emergency response implementation procedures;
- directory of vital services and resources;
- Emergency Operations Centre (EOC) procedures;
- communications procedures;
- alert/call out procedures;
- public information guidelines;
- evacuation guidelines;
- Emergency Support Services (ESS) guidelines;
- resource management (materiel and human);
- procedures for requesting provincial or federal assistance;
- procedures for declaring a local state of emergency;
- procedures for expending funds for emergency response and recovery; and
- livestock management.

In 2020, an evacuation plan was completed and distributed for the Mabel Lake/Kingfisher area, covered by the 2018 CWPP update. The RDNO has applied for more funding through the 2021 UBCM application process for completing additional evacuation plans within the RDNO.

As mentioned in subsection 2.2.6, Splatsin First Nation have compiled separate evacuation plans for five established Zones, which are available from their webpage (Splatsin, 2021).

2.5.2 Affiliated CWPPs

The RDNO's first CWPP was completed in October 2008, and implementation began in 2010. The CWPP update was split into two updates, with the first 2018 update completed in January 2019. Affiliated CWPPs for adjacent communities to this second 2020 update for the remaining RDNO AOI are:

- Armstrong and Spallumcheen - unknown year
- Coldstream – 2016
- Columbia Shuswap Regional District – currently working on Community Wildfire Resiliency Plans for several electoral areas
- Enderby - 2018
- Lumby - 2016
- RDNO - 2018 Phase 1 update
- Splatsin First Nation - 2009

This 2020 CWPP update builds on the 2018 update, and provides recommendations specific to the AOI. Opportunities exist to address similar recommendations at the regional level.

2.5.3 Local Government and First Nation Plans and Policies

All plans, policies and bylaws related to wildfire within the AOI have been reviewed. Any sections relevant to this CWPP are referenced in the following summaries. In addition, key recommendations and wildfire risk mitigation activities for the community are highlighted.

The RDNO has Official Community Plans (OCPs) covering all areas included in the CWPP AOI. Areas D and E are included in OCP bylaw 2485 (RDNO, 2011a). Area F is included in OCP bylaw 2702 (RDNO, 2016). Wildfire-related planning objectives and requirements for each OCP are listed under the subsequent headings.

Area D & E OCP, Bylaw 2485:

- Wildfire policy and considerations are listed in sections 3.6 and 9.5 (RDNO, 2011a)
  - The RDNO will continue working with appropriate agencies to prevent interface fires (policy 3.6.1)
  - Development should adhere to best practices to reduce the risk of wildfire damage or loss (policy 3.6.2)
  - The RDNO will work with FLNRORD to establish wildfire risk mapping for Areas D and E, which will inform evaluation and approval processes in areas of high fire hazard (policy 3.6.3)
  - Continue FireSmart education and wildfire codes of conduct in rural areas (policy 3.6.4)
  - Promote FireSmart principles for new construction, in accordance with retaining rural character (policy 3.6.5)
  - Provide support and encouragement for applying FireSmart principles to existing and new developments (policy 9.5.2)
- Official Development Permit Areas (DPAs) have not been established for wildfire
  - Policy 3.6.3 includes subsections a and b, which are similar to wildfire DPA requirements in other OCPs
  - Subsection a: in high wildfire hazard areas, subdivision or land use development resulting in ≥ 4 parcels or dwelling units require the following:
    - Wildfire Hazard Assessment Report prepared by an RPF with:
      - Assessments completed on and adjacent to the site
      - Wildfire susceptibility evaluation for the proposed development
      - FireSmart recommendations to reduce the wildfire hazard to moderate or below
    - Adherence to the Wildfire Hazard Assessment Report recommendations

- Registering a restrictive covenant to the property's title, containing the Report recommendations and ongoing requirements to mitigate the wildfire risk
    - o Subsection b: subdivision or land use development resulting in < 4 parcels or dwelling units within high wildfire hazard areas, or any subdivision or land use development within moderate wildfire hazard areas require the following:
        - Registering a standard restrictive covenant to the property's title that includes explicit wildfire mitigation practices

Area F OCP, Bylaw 2702:

- Wildfire policy and considerations are listed in sections 4.2, 11.2, and 16.5 (RDNO, 2016)
    - o The RDNO will advocate to the provincial government to keep implementing recommendations outlined in the Filmon Firestorm Report, including Area F-specific actions (policy 4.2.5)
    - o Continue FireSmart education (policy 11.2.3)
    - o Policy 16.5 establishes the Wildfire Hazard DPA in all areas of moderate or high wildfire hazard, with the following key requirements:
        - DPA applications require a site plan as per policy 16.5.3
        - DPA guidelines are listed in policy 16.5.4 though 16.5.7
        - Requirements include a Wildfire Hazard Assessment Report prepared by an RPF:
            - Recommendations must include specific actions to minimise wildfire hazard risk and be consistent with Environment and Natural Areas Objectives, and ecological values such as wildlife, soil conservation, and riparian habitat
            - Recommendations become conditions of the Development Permit
            - Registering a restrictive covenant to the property's title, containing Report recommendations and ongoing requirements to mitigate the wildfire risk
        - Issued Development Permits require reference to the Home Owners FireSmart Manual (policy 16.5.7)
        - Exemptions are provided (policy 16.5.8)

The Electoral Area Parks Regulation Bylaw 2835 (RDNO, 2020) includes the following requirements related to wildfire risk:

- Carrying or discharging firearms in a park, trail, or natural space is prohibited (policy 5.3)
- Fires are only permitted in areas specifically designed for that purpose (policy 6.2)

There is an Open Burning – Fire Regulation Bylaw that applies to RDNO Electoral Areas B and C (RDNO, 2011b). Similar bylaws have not been established for Areas D, E, and F.

Splatsin First Nation have prepared a Comprehensive Community Plan (Catherine Berris Associates Inc., 2013). The plan specifies design objectives for new housing projects, including to "balance wildfire mitigation measures with the priority of tree retention". Fire protection agreements with Enderby are in place. Splatsin are open to additional partnerships with Enderby for improving water systems.

2.5.4 Higher Level Plans and Relevant Legislation

In BC, there are several legal responsibilities and obligations relevant to wildfire use, prevention, control, and rehabilitation. The most critical provincial legislation and regulation are the *Wildfire Act*, and Wildfire Regulation. Other wildfire-related legal requirements are included in the Forest and Range Practices Act, the Park Act, the Environmental Management Act, the Hydro and Power Authority Act, the Forest Act, the Special Accounts Appropriation and Control Act, and the Open Burning Smoke Control Regulation.

The only identified higher level plan for this CWPP was the Okanagan Shuswap Land and Resource Management Plan (LRMP), which was prepared for Crown land in the Okanagan Shuswap Natural Resource District (Province of BC, 2001). Wildfire management and hazard reduction are referred to in Part 4 of the LRMP, with respect to Community/Crown Interface, Natural Disturbance Type 4 (NDT4), Mountain Goat Habitat, and Mule Deer Winter Range (see Table 7). None of these objectives and strategies conflict with wildfire mitigation work that could be carried out by the RDNO. Several objectives have been established in the area covered by the LRMP by Order of the Minister of Agriculture and Lands (Province of BC, 2007). None of these restrict the RDNO from pursuing strategic wildfire mitigation efforts.

Table 7: References to wildfire from the Okanagan Shuswap LRMP

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 NDT 4 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 wildfires 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 or Industry Plans

As required by internal Policy 9.4 – Fire Management Planning, FLNRORD (2008) prepares and maintains fire management plans for each Forest District. Fire management plans are internal documents that support cohesive wildfire management decision-making, as well as resource value protection in line with budget requirements. Their scope includes Crown land managed by the Forest District, reference to relevant fire and resource plans in the area, and integration with existing fire response/analysis, and resource management processes.

Fire management plans contain identification of values requiring protection from wildfire, and any wildfire-related issues specific to the Forest District. Examples of included landscape and local information, where they apply to the plan area, are listed below (FLNRORD, 2008):

- critical values at risk
- identified areas where wildfire is advantageous, and where wildfire is detrimental, with descriptions of conditions such as season and fire weather information
- areas planned for prescribed fire (e.g., ecosystem health, maintenance, wildfire threat reduction, silviculture purposes, etc.)
- identified areas for mechanical fuel management treatments near values requiring protection from wildfire
- forest and range activities that could help protect landscape values from wildfire
- relevant First Nations and cultural values

Although not available to the public, the fire management plan for the Okanagan Shuswap Natural Resource District was viewed by Frontline in 2015. At that time, the plan contained 15 pages of text, alongside maps that were categorized into four "priority themes" 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 (relating Theme 1 maintenance)
    - Energy generation and transmission, healthcare, first responder facilities, transportation, wildland structures, etc.
- Theme 3 – High Environmental Cultural
    - Water resources, species at risk, cultural values, etc.
- Theme 4 – Resource Values
    - Ungulate winter range, old-growth management areas, timber, silviculture investments, range management, and visual quality areas

SECTION 3: Values at Risk

Values at risk (VAR) include human life, property, critical infrastructure, high environmental and cultural values, and resource values, following similar themes to fire management plans developed by FLNRORD (2008).

The BCWS wildfire glossary of terms defines VAR as "the specific or collective set of natural resources and man-made improvements/developments that have measurable or intrinsic worth and that could or may be destroyed or otherwise altered by fire in any given area" (BCWS, 2021b). Although it can be difficult to assign values and hierarchy to the whole range of natural resources, the following sub-sections provide descriptions of the most prominent VAR within the AOI. This section also incudes a sub-section describing hazardous values that pose a safety hazard to emergency responders, and often become more dangerous when exposed to wildfire.

3.1 Human Life and Safety

In the event of a threatening wildfire, the highest priority is to protect human life and safety, which often requires evacuating areas at risk. Evacuations take time, despite sometimes quick and unpredictable wildfire behaviour. Safe egress may be blocked by the wildfire, vehicle congestion, accidents, or other factors.

Total population and dwellings within Areas D, E, and F, and for the entire province have been summarised in Table 8, based on the 2016 Census data (Statistics Canada, 2017abc). It was not possible to extract data for the AOI, so trends are presented for the entirety of each electoral area. In 2016, there were 7,682 people living in Areas D, E, and F, and a total of 3,998 private dwellings. This equates to 1.2 people per square kilometer living in the 6,166 km^2 land area. Area F, covering rural Enderby, has the highest concentration of people and dwellings, and Area E, covering Cherryville, has the lowest. Overall, the inhabitant concentration in these areas is only 24% of the average for BC.

Table 8: 2016 Census population and dwelling data for RDNO Electoral Areas D, E, and F, and for BC (Statistics Canada, 2017abc)

Geographic Location	Population	Total private dwellings	People/km^2	Land Area (km^2)
RDNO Area D	2,672	1,236	1.5	1,792
RDNO Area E	1,010	461	0.4	2,606
RDNO Area F	4,000	2,301	2.3	1,768
RDNO Area D, E, & F	7,682	3,998	1.2	6,166
British Columbia	4,648,055	2,063,417	5.0	922,503

Age distribution for Areas D, E, and F, and for BC are presented in Figure 4, as per the 2016 Census data (Statistics Canada, 2017abc). Trends indicate that all Areas covered by this CWPP have lower proportions of people 85 years and older compared with the average for BC, whereas the opposite is true for people 65 years and over. The majority (65%) of the population throughout all areas, and for BC is 15-64 years old. Children and adults aged 0-14 years make up 17% in Area E, 15% in Area D and BC, and 14% in Area F.

In Area D, people and dwellings are concentrated south of Lavington, around Lumby, in the Creighton Valley and Echo Lake areas, around Highway 6, Bear Valley Road, Shuswap River Drive, Lumby Mabel Lake Road, and at Mabel Lake. Mabel Lake Provincial Park has high use within the fire season, with 84 regular sites, and a group camp site.

In Area E, people and dwellings are concentrated in and around Cherryville, around Highway 6, Creighton Valley Road, North Fork Road and Currie Creek, Sugar Lake Road, and Sugar Lake. Three Sugar Lake Recreation Sites (1, 2, and 3 Mile) have high use within the fire season, as well as Cherryville Recreation Site.

In Area F, people and dwellings are concentrated in and around Grindrod, and around Enderby city; although, people and dwellings can be found throughout the plan area portion that covers Area F. Mara Lake is a popular destination during the fire season. Less people are concentrated in Enderby Cliffs Provincial Park, Mara Meadows Provincial Park, and at Larch Hills Trails Recreation Site. The small Rosemond Lake Recreation Site provides two campsites; although, access is not easy.

RDNO - Area D

85 years and over 1%

65 years and over 19%

0 to 14 years 15%

15 to 64 years 65%

RDNO - Area E

85 years and over 1%

65 years and over 18%

0 to 14 years 17%

15 to 64 years 64%

RDNO - Area F

85 years and over 1%

65 years and over 20%

0 to 14 years 14%

15 to 64 years 65%

British Columbia

85 years and over 2%

65 years and over 18%

0 to 14 years 15%

15 to 64 years 65%
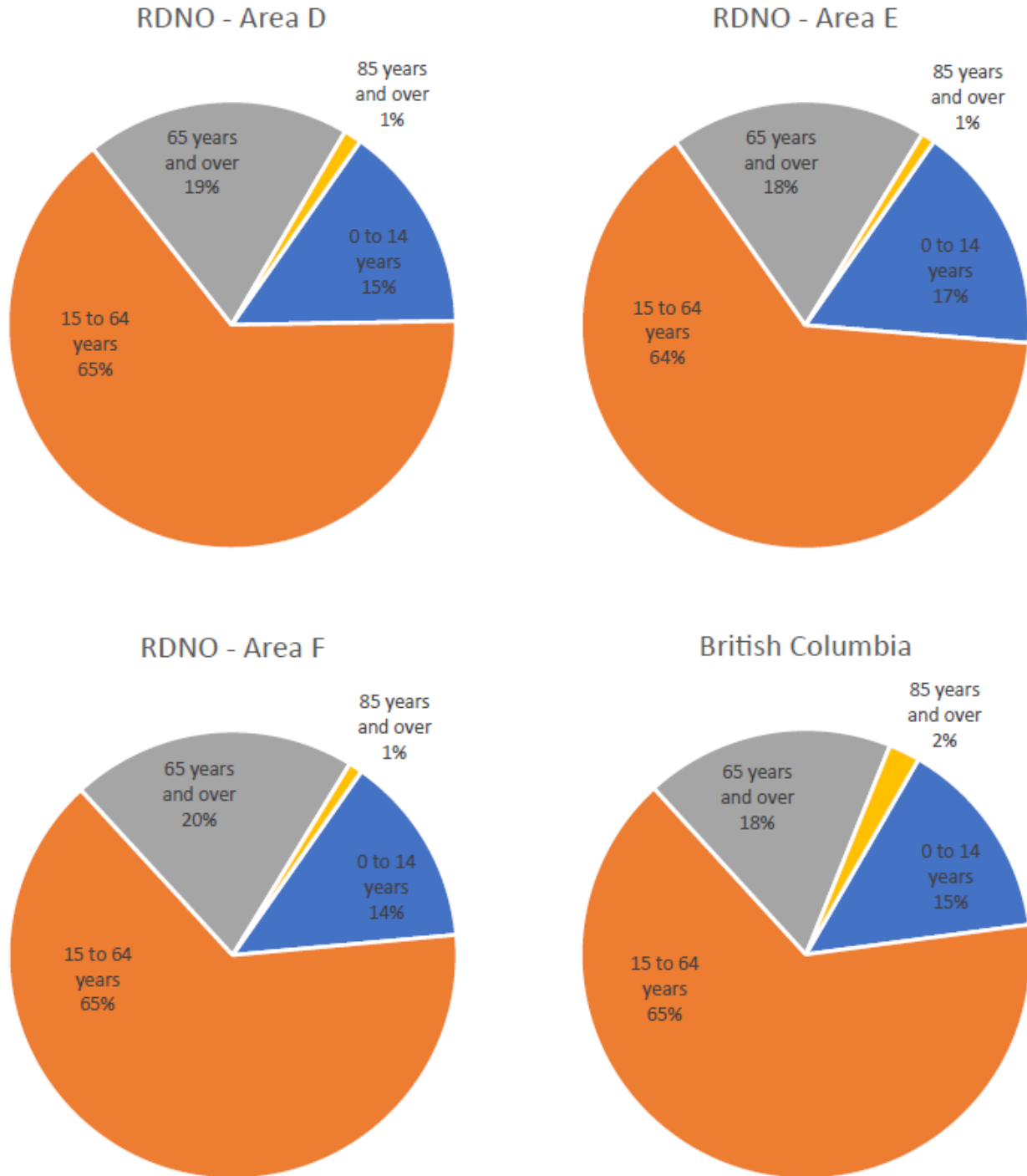
Figure 4: 2016 Census age distribution in the RDNO Electoral Areas D, E, and F, and in BC (Statistics Canada, 2017abc)

Recent experience has shown that wildfire impacts are not solely limited to property damage. Wildfire smoke contains several hundred compounds, including carcinogenic gases such as carbon monoxide and nitrogen oxides, and particulate matter (PM) which is a mix of microscopic solid particles and liquid droplets containing organic and black carbon (Naeher, et al., 2007). Smoke from boreal and temperate forests contains fine particles less than 2.5 micrometers (μm), referred to as $PM_{2.5}$. Even short-term exposure to the $PM_{2.5}$ found in wildfire smoke can be

detrimental to public health, due to its ability to infiltrate deep into the respiratory system (Durán, 2014).

The BC Centre for Disease Control (2018) summarises the composition and health effects of wildfire smoke, how to protect yourself, and identifies the following groups as being most at risk:

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

3.2 Critical Infrastructure

Publicly and provincially owned critical infrastructure assets are owned by the Provincial government, local government, public institutions (such as a health authority or school district), First Nation, or Treaty First Nation that are essential to the community's health, safety, security, or economic wellbeing, as well as and for effective functioning of government. They can also be assets identified in a Local Authority Emergency Plan Hazard, Risk & Vulnerability, and Critical Infrastructure assessment.

Within this CWPP AOI, the RDNO relies on critical infrastructure, as per the following sub-sections for electrical power (3.2.1), communications, pipelines, and publicly owned buildings (3.2.2), and water and sewage infrastructure (3.2.3).

3.2.1 Electrical Power

Electrical power is provided to residents within the AOI through the BC Hydro transmission system, starting from the Revelstoke and Mica generating stations that produce up to 2,480 MW, and 2,746 MW of electricity per year, respectively. The electricity is transformed into lower voltages as it passes through various substations, where it is eventually stepped down for residential supply through distribution lines. Table 9 provides a summary of the various transmission line locations within the AOI, as well as the circuit name and voltage (BC Hydro, 2019a).

Table 9: BC Hydro (2019a) transmission line locations within the AOI

RDNO Electoral Area	Circuit Name	Voltage (kV)	Circuit Start/Finish Substations
Areas D & E	5L091	500	Selkirk to Ashton Creek
Areas D & E	1L201	138	Monashee to Vernon terminal
Areas D & E	1L202	138	Monashee to Vernon terminal
Area F	5L076	500	Ashton Creek to Nicola
Area F	5L079	500	Ashton Creek to Nicola
Area F	2L240	230	Ashton Creek to Salmon Arm
Area F	1L218	138	Salmon Arm to Vernon terminal

The 500 kV 5L091 transmission line enters the AOI in Area D northeast of Lumby, where it crosses Hwy 6 towards Echo Lake, then enters Area E near Creighton Valley Road, and follows Hwy 6 at the southern section of the AOI. The 138 kV 1L201/1L202 transmission lines follow Hwy 6 closely through the Areas D and E AOI. The 500 kV 5L076/5L079 transmission lines enter the Area F AOI along the Shuswap River, then enter Splatsin First Nation before exiting the AOI to the west. The 230 kV 2L240 transmission line enter the Area F AOI along the Shuswap River, then enter Splatsin First Nation before heading north and exiting the AOI.

Finally, the 138 kV 1F218 transmission line enters the Area F AOI from the northwest, and roughly follows Hwy 97B towards Enderby, where it exits the AOI through the city, enters again through Splatsin First Nation, and exits to the south. The Enderby substation is located adjacent to the municipal boundary within the AOI, where it steps the 138 kV down to 25 kV for distribution to Enderby.

Along the Shuswap River in Areas D and E, BC Hydro own four facilities – Sugar Lake Dam, Shuswap Falls Picnic Area, Shuswap Falls Recreation Site, and Wilsey Hydroelectric Dam; however, they are not fully functioning, and have been promoted as public interest and recreation sites (BC Hydro, 2019b; 2021). The Sugar Lake Dam and Reservoir release water into the Shuswap River, where it combines with other inflows towards the Wisley Hydroelectric Dam, which currently generates 12 GW hours per year, or < 0.1% of BC Hydro's annual hydroelectric generation capacity. In December 2019, BC Hydro initiated the Wilsey Fish Passage Project to restore fish passage, where it is still in the early stages (BC Hydro, 2019b). Currently, the Wisley Dam only operates with one functioning unit, and restoring full capacity would require significant investment.

3.2.2 Communications, Pipelines and Publicly Owned Buildings

There are six TELUS and two Rogers cellular communications towers located within the CWPP AOI (Nikkel, 2021). Table 10 provides coordinates and a location description for each tower.

Table 10: Cellular tower providers and locations within the AOI (Nikkel, 2021)

RDNO Electoral Area	Provider	Latitude (decimal degrees)	Longitude (decimal degrees)	Location Description
Area D	Telus	N50.2086	W118.9592	Satellite Hill (South of Lumby)
	Telus	N50.2086	W118.9594	Satellite Hill (South of Lumby)
	Rogers	N50.2087	W118.9594	Satellite Hill (South of Lumby)
Area E	Telus	N50.228	W118.6167	Near Chochrane Rd, Cherryville
Area F	Telus	N50.5683	W119.0961	Enderby Cliffs Provincial Park
	Telus	N50.5681	W119.0961	Enderby Cliffs Provincial Park
	Telus	N50.6574	W119.0961	Off Zettergreen Rd, Mara
	Rogers	N50.6574	W119.0612	Off Zettergreen Rd, Mara

There are a couple of Fortis BC natural gas pipelines within the AOI. In Area D, just over 1 km of pipeline runs adjacent to Hwy 6, west of Lumby. In Area F, multiple pipeline sections run through Splatsin First Nation, exit the AOI into Enderby, and enter again, heading northwest near Hwy 97B. The Fortis BC Corporate Emergency Response Plan states that they will work with emergency services in the event of a wildfire (Fortis BC, 2021).

Eight key buildings were identified within the AOI. These include community halls, public and independent schools, a recreation centre, and a museum. Refer to Table 11 for a list of the facilities by RDNO Area and location.

Table 11: Key public buildings and schools within the AOI, summarised by RDNO Electoral Area

RDNO Electoral Area	Facility	Location	Type
Area D	Mabel Lake Community Hall	111 Shuswap Falls Rd, Lumby	Community Hall
	Mabel Lake Community Hall	2445 Lumby Mabel Lake Rd, Lumby	Community Hall
	Okanagan Waldorf School	730 Whitevale Rd, Lumby	Independent Elementary School
Area E	Cherryville Community Hall	158 North Fork Rd, Cherryville	Recreation Centre
	Cherryville Elementary	108 North Fork Rd, Cherryville	Public Elementary School
	Cherryville Museum	87 North Fork Rd, Cherryville	Museum
Area F	Christian Homelearners eStream	Grindrod, BC	Independent Elementary/Secondary School
	Grindrod Elementary	Grindrod, BC	Public Elementary School

3.2.3 Water and Sewage Infrastructure

Much of the AOI in this CWPP covers rural communities, where residents source water from private wells, and/or have their own septic fields. Some residents may rely on municipal facilities located outside the AOI, such as drinking water systems from surface water intakes and wells, and sanitary sewer systems in Enderby and Lumby. Overall, wastewater in the RDNO is managed by on-site septic systems, and a community wastewater treatment system.

Greater Vernon Water (GVW) was formed in 2003, supplying water to the more densely populated areas, such as Vernon, Coldstream, and Spallumcheen, as well as Electoral Areas B, C and D (RDNO, 2021b). Annually, GVW provides approximately 24 billion litres of water to customers, through pipelines and pumps stations. About 55% of the GVW supply is sourced from the Duteau Creek., which is partially located with in the AOI in Area D. Treatment occurs outside the AOI at the ultraviolet Duteau Creek Water Treatment Plant.

GVW aim "to ensure the economical supply and distribution of a sufficient quantity and quality of water in the interests of both agricultural and non-agricultural users in the Greater Vernon Community. GVW is committed to protecting public, environmental, and economic health through a comprehensive "source-to-tap" approach" (RDNO, 2021b). The 2017 Master Water Plan is available for guidance on utility and infrastructure improvements, renewal decisions, and water system status (Marcolin & Banmen, 2017).

In Area F, the RDNO (2016) operate and maintain two water utilities within the AOI (Grindrod, and Gunter-Ellison). The Grindrod Community Water System supplies about 50 customers with treated water from the Shuswap River (RDNO, 2021b). The Grindrod Water Utility (GRW) has been in use since 1997, with a capacity to treat up to 254 litres of water per minute that is gravity fed to a concrete reservoir that can hold up to 240 m^3 (Hewitt & de Pfyffer, 2019). In 2019, 42,733 m^3 of water was processed through the GRW, which is licenced for up to 286,731 m^3 annually. In the event of a fire, responders may use a pump to obtain water from the Shuswap River. The Gunter-Ellison Water Utility (GEW) supplies customers in rural Enderby with water via a ~1,000 m water main (RDNO, 2000; 2017; 2021b).

3.3 High Environmental and Cultural Values

The intent of this sub-section is to identify high environmental and cultural values, and describe where they are located in order to effectively determine wildfire risk and identify mitigation activities. Themes are presented in the following sub-sections for drinking water supply area and community watersheds (3.3.1), cultural values (3.3.2), and high environmental values (3.3.3).

Parks, recreation, and cultural services are provided by the RDNO in a few areas through municipal partners and advisory committees. White Valley Parks, Recreation & Culture manages Electoral Areas D and E, including various Community Halls, and Parks. Area F Parks & Culture provides grant funding to various Community Halls, and manages Grindrod Park. Environmental Services provided by the RDNO are focussed on noxious weeds and invasive plants, starling control, and noxious insects.

3.3.1 Drinking Water Supply Area and Community Watersheds

Communities depending on surface water from a specific watershed should be aware that wildfire may cause significant damage to soils, high rates of sedimentation and/or landslides that could degrade water quality for many years. In worst-case scenarios, the water supply may have to be abandoned (temporarily or permanently), or new water treatment infrastructure may need to be built, which could take several years and require substantial funding.

Three community watersheds marginally overlap the AOI. Names, locations and overlap area is summarised below:

- Duteau Community Watershed – Area D – 1,968 ha
- East Canoe Community Watershed – Area F – 350 ha
- Brash Community Watershed – Area F – 25 ha

Water treatment facilities are mostly located outside the AOI, except for GRW in Area F (see sub-section 3.2.3). The Duteau Creek Water Treatment Plant is located near the AOI in Area D. The facility was built in 2010, with completion of the Ultraviolet Disinfection Facility in 2019 (RDNO, 2021b). Plant capacity is 160ML, or 42 million gallons, per day. The Plant utilizes Dissolved Air Flotation (DAF), combined with Ultraviolet Disinfection to treat the water, which is sourced from the Duteau Community Watershed.

3.3.2 Cultural Values

Indigenous cultural heritage resources include archaeological sites, traditional use sites, historic buildings and artefacts, and heritage trails, or any other objects or places of "historical, cultural or archaeological significance to British Columbia, a community or an aboriginal people" (Archer, 2009).

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. The Archaeology Branch of the FLNRORD administers the provisions of the HCA, and are responsible for making final decisions concerning archaeological resource

management. Day-to-day planning, research, and fieldwork are conducted by professional consulting archaeologists.

Non-archaeological cultural heritage in BC is generally not shared with the public due to their sensitive and confidential nature. Local First Nations have the right to keep access to these resources private. Due to an extensive and uninterrupted First Nation presence throughout the North Okanagan, 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 basic awareness of what to look for can help ensure that cultural heritage resources are not impacted by suppression actions. Through agreement and trust, general information regarding cultural heritage resources could be shared. It is incumbent on field personnel to be able to identify known resources so suppression actions may be planned or altered in accordance with the HCA.

3.3.3 High Environmental Values

The BC Conservation Data Centre (CDC) provides information about species and ecosystems at risk through the BC Species and Ecosystems Explorer, and CDC iMap (BC Conservation Data Centre, 2021). Recorded occurrences of Red and Blue listed animals and plants within the AOI have been summarised in Table 12. There were no recorded occurrences of ecological plant communities at risk in the queried dataset. The Species and Ecosystems Explorer was queried to collate a list of Red and Blue listed animals, plants, and plant communities that might be found within the AOI. This list is presented in Appendix 1 – a useful reference tool for fire preparedness, and fuel management fieldwork activities.

Two Fisheries Sensitive Watersheds overlap the AOI in Areas D and E, including those of Bessette Creek (f-8-004) and Cherry Creek (f-8-005). These fisheries sensitive watersheds require special management to protect salmonid fish habitat, as authorized by the Okanagan Region order made under the *Government Actions Regulation* (BC Reg 582/2004).

Table 12: Recorded occurrences of Red and Blue listed species within the AOI, obtained from a CDC iMap query

Common name	Scientific name	BC list status
Vertebrate animals		
American Badger	*Taxidea taxus*	Red
Bobolink	*Dolichonyx oryzivorus*	Blue
Great Basin Spadefoot	*Spea intermontana*	Blue
Great Blue Heron, Herodias Subspecies	*Ardea herodias herodias*	Blue
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta* pop. 2	Blue
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Blue
Western Screech-owl, Macfarlanei Subspecies	*Megascops kennicottii macfarlanei*	Blue
Western Skink	*Plestiodon skiltonianus*	Blue
Invertebrate animal		
Western Bumble Bee	*Bombus occidentalis*	Blue
Vascular plants		
Okanagan hawthorn	*Crataegus okanaganensis var. longispina*	Red
Brown Beak-rush	*Rhynchospora capillacea*	Blue
Round-leaved hawthorn	*Crataegus orbicularis*	Blue
Sheila Phipps' hawthorn	*Crataegus sheila-phippsiae var. sheila-phippsiae*	Blue
Yellow Widelip Orchid	*Liparis loeselii*	Blue
Nonvascular plants		
Ovate Cupola Moss	*Cinclidium subrotundum*	Red
Showy Bristle Moss	*Orthotrichum elegans*	Blue
Turgid Scorpion Moss	*Pseudocalliergon turgescens*	Blue

3.4 Other Resource Values

Agriculture plays a significant role in the local economy in many parts of the AOI. Wildfire can have significant direct and indirect impacts on all agricultural sectors. For example, wildfires may displace or kill cattle while on their summer range, and food crops may be directly impacted by prolonged smoke-filled skies. Evacuation orders or worker displacement may limit producer ability to harvest crops on time.

3.5 Hazardous Values

The AOI is not characterized by extensive heavy industry and the associated potentially hazardous materials. As with many communities, the AOI contains gas stations, natural gas utilities, water treatment chemicals, and agricultural inputs. The RDNO operates eight Diversion and Disposal Facilities, three transfer stations, and six landfills (three open and three closed). Of these, only the Cherryville & Area Transfer Station is located within the AOI, at 205 Aumond Road in Area E (RDNO, 2021b). The RDNO has the goal of maximizing material diverted from the landfill via recycling and alternate / secondary uses.

SECTION 4: Wildfire Threat and Risk

This section presents a summary of factors that help to determine wildfire risk around the community. These factors include natural fire regime and ecology, Provincial Strategic Threat Analysis (PSTA), and local wildfire risk analysis.

A risk-based framework consists of a consideration of the likelihood of an unwanted wildfire event, combined with the consequences to communities and high value resources and assets to measure risk, as follows:

- Likelihood is the probability of the unwanted wildfire event occurring.

- Consequence is the amount of damage occurring as a result.

- Risk is measured as the product of likelihood and consequence, but multiple inputs are also required in order to effectively quantify risk, including severity, value type, and vulnerability.

Through the identification of risk level, priorities for mitigation, as well as opportunities for increasing community resiliency are enhanced.

4.1 Fire Regime, Fire Weather and Climate Change

This sub-section provides the ecological context of wildfire for RDNO's northern and eastern communities, and describes the role of fire (frequency and intensity) in the local ecosystems under historical conditions, as well as potential implications of future conditions caused by the interruption of the natural fire cycle and/or climate change.

4.1.1 Fire Regime and Fire Weather

Rural Enderby, Lumby, and Cherryville are located in the Interior Douglas-fir (IDF) Biogeoclimatic (BEC) Zone, commonly characterized by dry, open canopy Douglas-fir forests, intermixed with grasslands (BC Ministry of Forests, 1991). These ecosystems have been maintained by frequent low-intensity surface fires, classifying them into the Natural Disturbance Type 4 (NDT4) regime (BC Ministry of Forests, 1995). Table 13 presents the natural disturbance regime classification types and descriptions for wildfire, windstorm, insect, and landslide disturbance agents. Much of the AOI falls into the NDT4 category, which covers the lower to middle elevations of this CWPP, along with denser population, dwellings, and infrastructure.

Table 13: Natural disturbance regime classification types recognized in BC.

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 events
NDT5	Alpine Tundra and Subalpine Parkland ecosystems

The higher elevations and northern parts of this plan area are represented by ecosystems within the Interior Cedar-Hemlock (ICH) Zone, which are cooler and wetter than the IDF. The natural disturbance regimes range from NDT 3 to NDT 2, with NDT 2 occurring at higher elevations. A very minor portion of the Engelmann Spruce – Subalpine Fir (ESSF) Zone is found at the highest elevations in the southeastern portion of the AOI, which are cold and very wet, with NDT 2 or 1.

In terms of fire type and intensity, stand-maintaining events in NDT4, and stand-initiating events in NDT1 through NDT3 are typically different (BC Ministry of Forests, 1995). In NDT4, frequent low-intensity surface fires keep ecosystems in a steady state, whereas rare to infrequent high-intensity crown fires generally destroy NDT1 through NDT3 ecosystems, causing new successional processes to occur and create new forests. Surface fires historically occurred in NDT4 every 4 to 50 years; however, over 70 years of fire suppression and forest protection efforts have reduced the frequency of surface fires in NDT4, resulting in denser forest stands, with understorey build-up. Consequently, stand-initiating events are occurring more often within NDT4, due to higher intensity fires that become crown fires in forests that have not been maintained by frequent surface fires. Prior to wildfire exclusion activities, destructive crown fires were seldom observed within the IDF, occurring every 150 to 250 years or more, for example. This trend is causing firefighting to be more dangerous, and to require more suppression effort and cost. Understanding, and reducing the wildfire risk is imperative within these NDT4 ecosystems.

Seven BCWS weather stations were selected for review and analysis, which collectively provide summary of fire weather for the plan area. Figure 5 presents the locations of the Mabel Lake 2, Salmon Arm, Fintry, Curwen Creek, Kettle 2, Larch Hills West, and Station Bay 2 weather stations in relation to the RDNO. Although Larch Hills West, and Station Bay 2 were only installed 2-3 years ago, they have been included to provide added comparison for recent years. Table 14 provides detail for each analysed weather station, including latitude and longitude in decimal degrees, elevation, and recorded installation date.
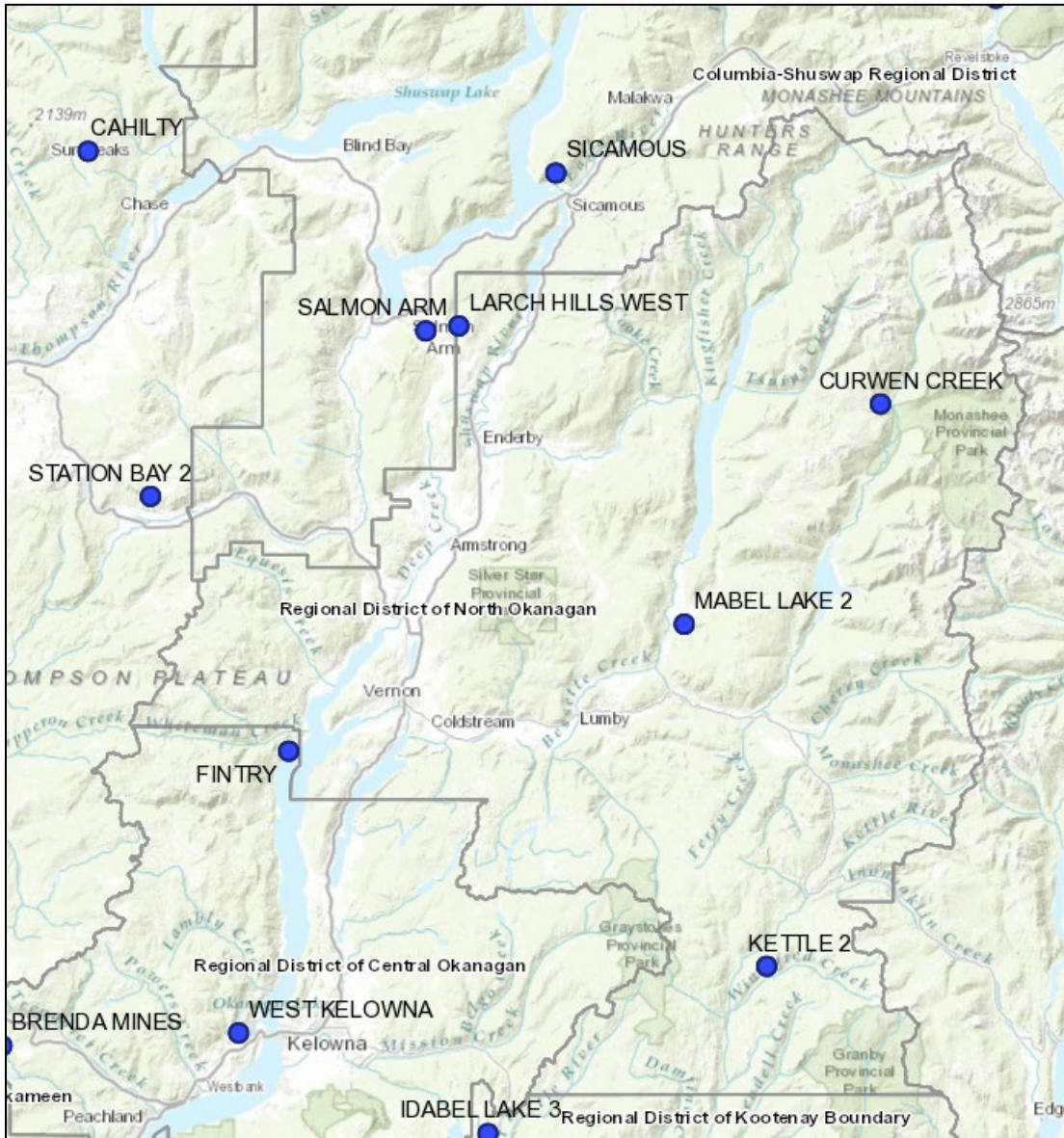
Figure 5: BC Wildfire Service fire weather stations in the RDNO region.

Table 14: BC Wildfire Service active fire weather station particulars.

Station Name	Latitude	Longitude	Elevation (m)	Install Date
Mabel Lake 2	50.352	-118.773	488	01-Jan-87
Salmon Arm	50.685	-119.235	527	04-Oct-89
Fintry	50.207	-119.480	670	12-Jul-90
Curwen Creek	50.602	-118.423	1,286	08-Jul-90
Kettle 2	49.960	-118.626	1,389	08-Aug-87
Newer Stations				
Larch Hills West	50.691	-119.176	892	14-Jun-18
Station Bay 2	50.497	-119.727	1,100	29-May-19

Fire weather patterns for each station are presented in terms of Fire Danger Class, as per the CWPP process in BC. The Wildfire Regulation (BC Reg 38/2005) defines Fire Danger Class as a derivative of Danger Region and indices from the Canadian Forest Fire Weather Index (FWI) System. The Canadian Forest FWI System is the primary subsystem of the Canadian Forest Fire Danger Rating System, which uses weather observations to derive various ratings based on fuel moisture content and windspeed (Van Wanger, 1987; Stocks, et al., 1989). Fire Danger Class is normally used to restrict high risk activities; however, its use has been extended to the CWPP fire weather analysis to provide insight into relative risk of a fire start in the region.

In BC, three Danger Regions have been defined in Schedule 1 of the Wildfire Regulation (BC Reg 38/2005). Schedule 2 provides tables for each Danger Region, which categorise Fire Danger Class 1 through 5 using numerical ratings for Buildup Index (BUI), and FWI (Wildfire Regulation, BC Reg 38/2005). Figure 6 depicts how fire weather observations feed into the FWI System to derive the BUI, and FWI, eventually combining with Danger Region to determine Fire Danger Class.
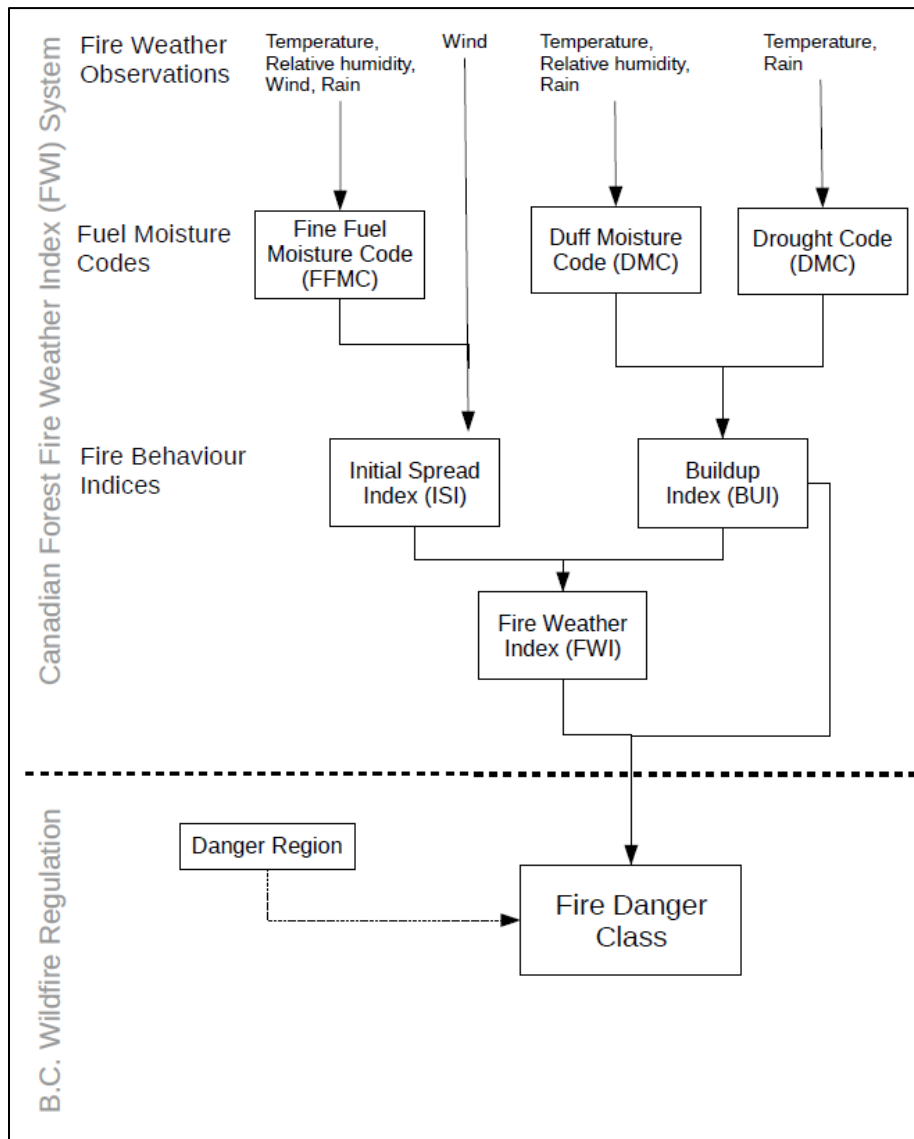
Figure 6: Fire Danger Class methodology flowchart from the Canadian Forest Fire Danger Rating System.

Most of this CWPP's AOI falls into Danger Region 1, along with the Mabel Lake 2, Salmon Arm, Curwen Creek, and Larch Hills West weather stations. Danger Region 3 covers a minor AOI portion south and west of Lumby, along with the Fintry, Kettle 2, and Station Bay 2 weather stations. Fire Danger Class bar graphs have been produced for each weather station, summarising the number of days per year when Fire Danger Class rating was 4 or 5, as well as 4+5 combined (see Figure 7 through Figure 12). The potential BUI and FWI ranges for each analysed Fire Danger Class category and Danger Region are presented in Table 15 (adapted from Schedule 2, Wildfire Regulation, BC Reg 38/2005). Danger Region 1 includes lower BUI and FWI values in each Fire Danger Class range, compared with Danger Region 3.

Table 15: BUI and FWI ranges by Fire Danger Class category and Danger Region.

	Fire Danger Class 4		Fire Danger Class 5		Fire Danger Class 4+5	
	BUI	FWI	BUI	FWI	BUI	FWI
Danger Region 1	70 - 119 +	8 - 16	119 +	17 - 31 +	20 - 119 +	8 - 31 +
	43 - 118	17 - 30	70 - 119 +	31 +		
	20 - 42	31 +				
Danger Region 3	141 - 201 +	17 - 27	91 - 201 +	47 +	51 - 201 +	17 - 47 +
	91 - 201 +	28 - 46				
	51 - 90	47 +				

In addition to the bar graphs, summary Table 16 provides an overall summary of Fire Danger Class ratings for each weather station, in terms of average, median, and maximum days, as well as the year of maximum Fire Danger Class days. The Larch Hills West and Station Bay 2 weather stations were recently installed in 2018 and 2019, respectively, which limited the datasets. The following trend observations exclude these two weather stations. Average Fire Danger Class 4 days ranged from 11 at Kettle (1,389 m elevation), to 21 and 28 at Curwen Creek and Mabel Lake 2, respectively (1,286 and 488 m elevation), to 40 and 44 at Salmon Arm and Fintry, respectively (527 and 670 m elevation). Average Fire Danger Class 5 days ranged from 2 and 3 at Kettle 2 and Fintry, respectively, to 6 at both Mabel Lake 2 and Curwen Creek, to 26 at Salmon Arm. Average combined Fire Danger Class 4 and 5 days ranged from 13 at Kettle 2, to 26 at Curwen Creek, to 34 at Mabel Lake 2, to 48 at Fintry, to 66 at Salmon Arm. This trend is mirrored by the maximum number of combined Fire Danger Class 4 and 5 days observed in one season, ranging from 69 at Kettle 2, to 81 at Curwen Creek, to 106 at both Mabel Lake 2 and Fintry, to 133 at Salmon Arm. Overall, the most common year of maximum was 2017.

Table 16: Summary of Fire Danger Class 4 and 5 days from BC Wildfire Service weather stations.

Station Name / Danger Region	Period	Danger Class	Days			Year of Maximum
			Average	Median	Maximum	
Mabel Lake 2	1987-2020	Danger Class 4	28	29	59	2017
Danger Region 1		Danger Class 5	6	2	64	1998
		Danger Class 4+5	34	32	106	1998
Salmon Arm	1989-2020	Danger Class 4	40	42	65	2007
Danger Region 1		Danger Class 5	26	16	94	2017
		Danger Class 4+5	66	64	133	2009
Fintry	1989-2020	Danger Class 4	44	45	86	2017
Danger Region 3		Danger Class 5	3	1	20	2017
		Danger Class 4+5	48	52	106	2017
Curwen Creek	1990-2020	Danger Class 4	21	22	52	2012
Danger Region 1		Danger Class 5	6	1	56	2017
		Danger Class 4+5	26	25	81	2017
Kettle 2	1987-2020	Danger Class 4	11	6	45	2017
Danger Region 3		Danger Class 5	2	0	24	2017
		Danger Class 4+5	13	6	69	2017
Larch Hills West*	2018-2020	Danger Class 4	9	11	13	2018
Danger Region 1		Danger Class 5	0	0	0	N/A
Station Bay 2*	2019-2020	Danger Class 4	10	10	20	2020
Danger Region 3		Danger Class 5	0	0	0	N/A

* There were limited years of observations for Larch Hills West and Station Bay 2, which are not sufficient for observing meaningful trends. There were no Danger Class 5 days recorded for either weather station, so the Danger Class 4+5 category was omitted from the analysis.
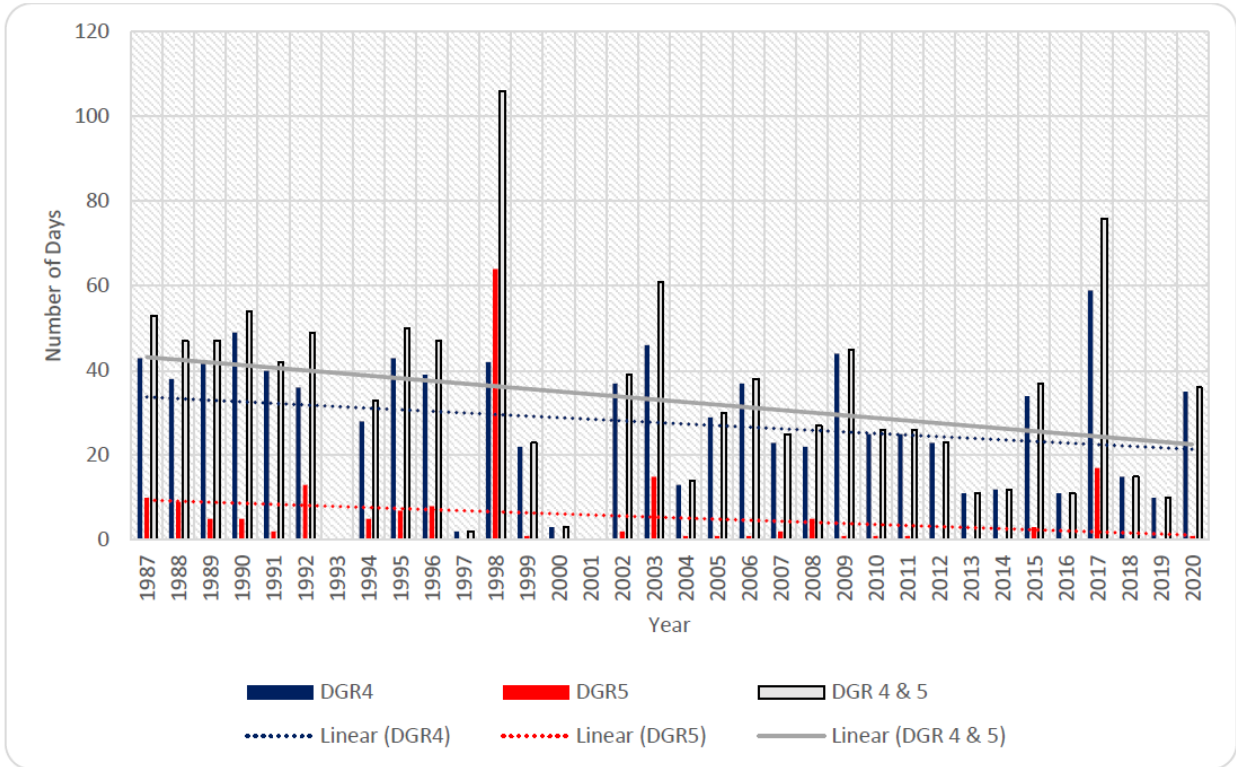
Figure 7: BC Wildfire Service Mabel Lake 2 weather station Danger Class 4 and 5 graph (1987-2020).
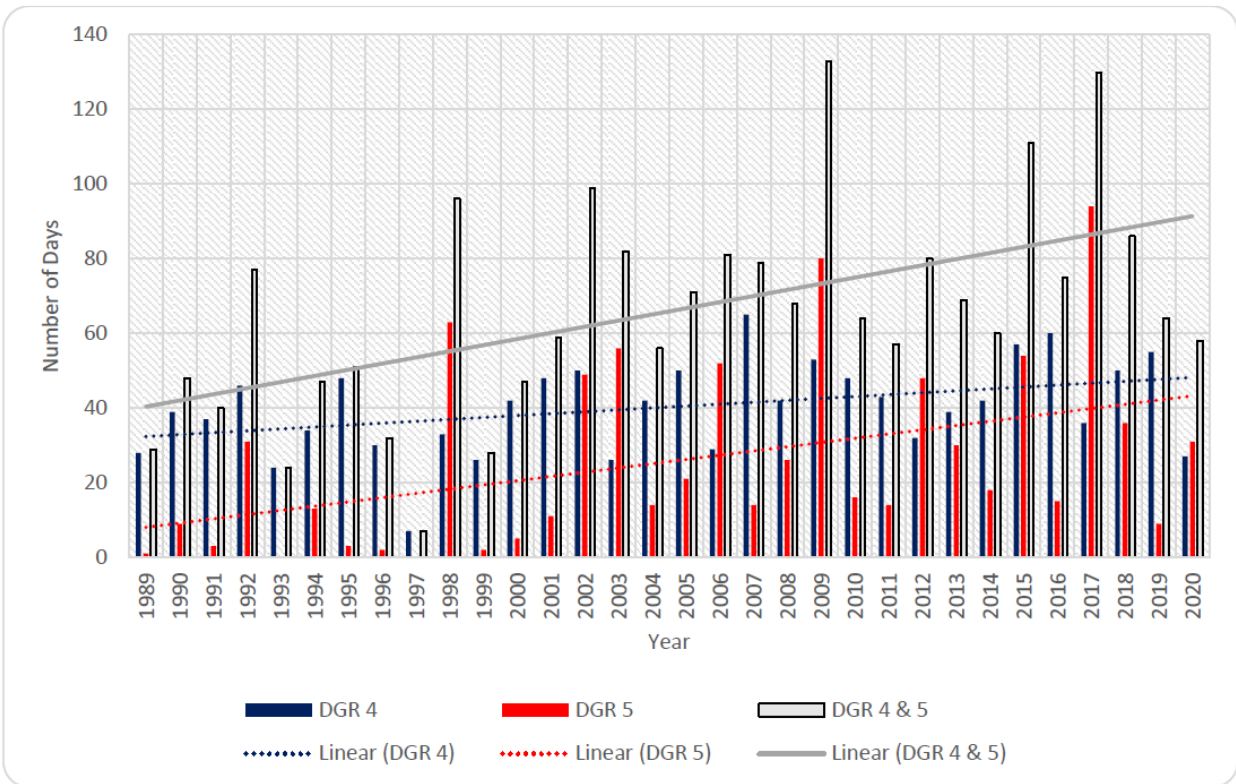
Figure 8: BC Wildfire Service Salmon Arm weather station Danger Class 4 and 5 graph (1989-2020).
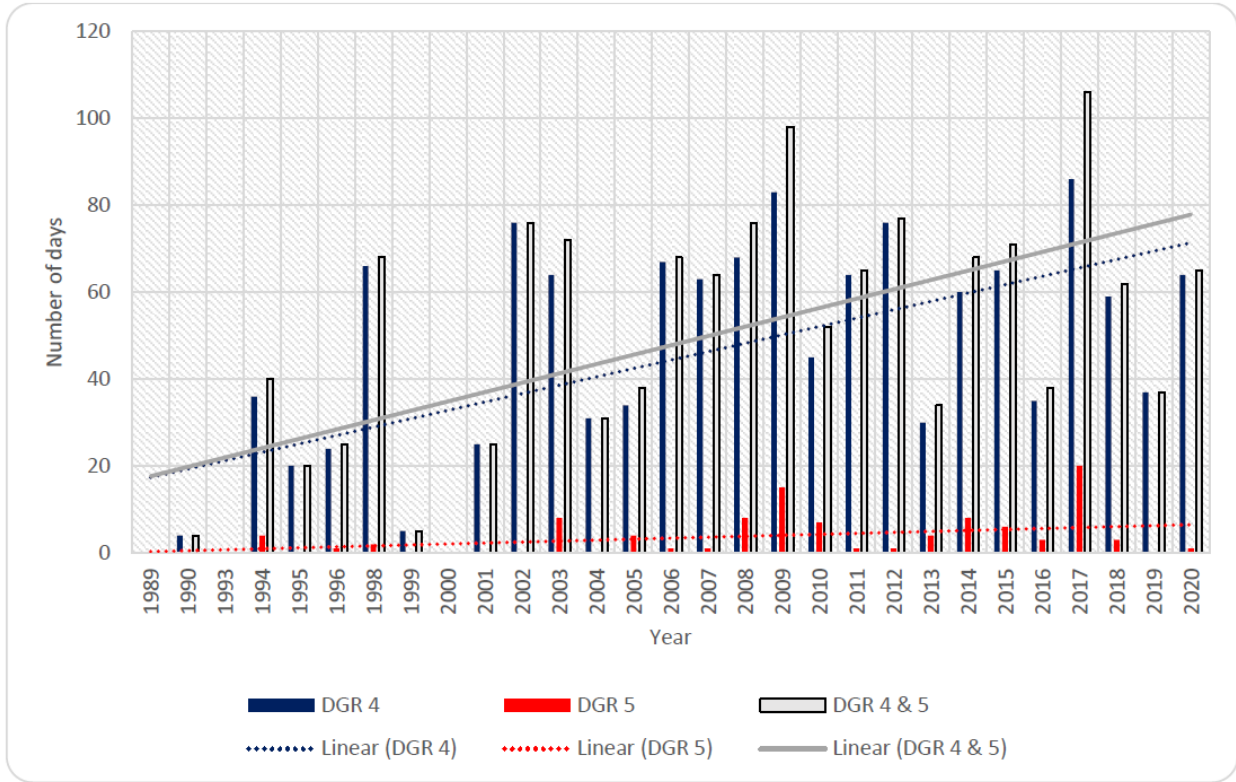
Figure 9: BC Wildfire Service Fintry weather station Danger Class 4 and 5 graph (1989-2020).
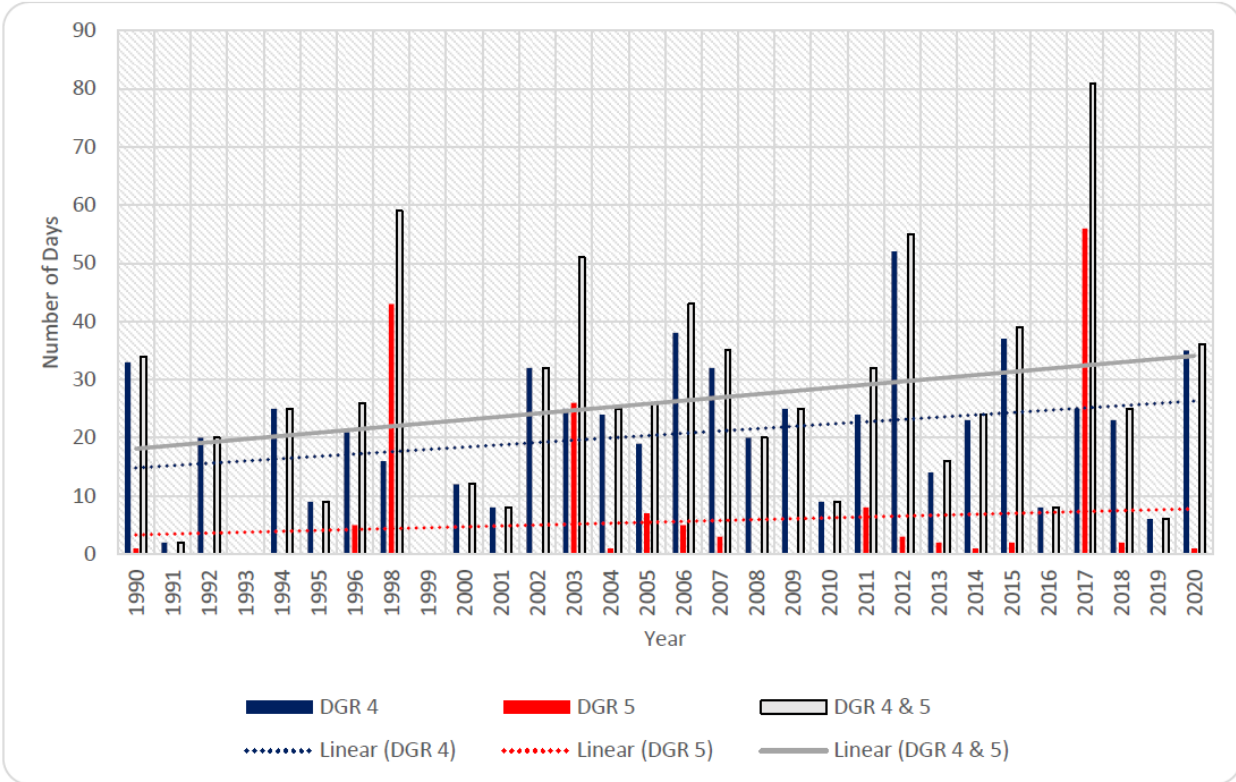
Figure 10: BC Wildfire Service Curwen Creek weather station Danger Class 4 and 5 graph (1990-2020).
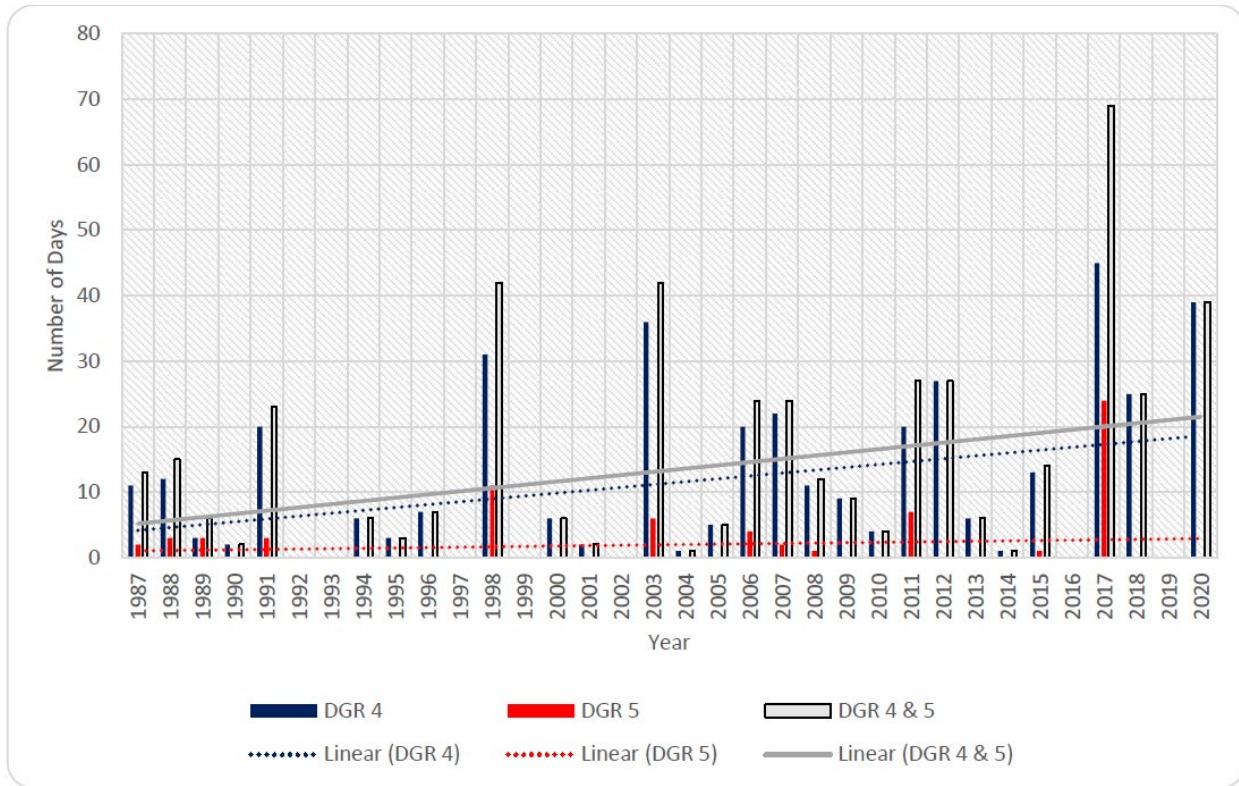
Figure 11: BC Wildfire Service Kettle 2 weather station Danger Class 4 and 5 graph (1987-2020).
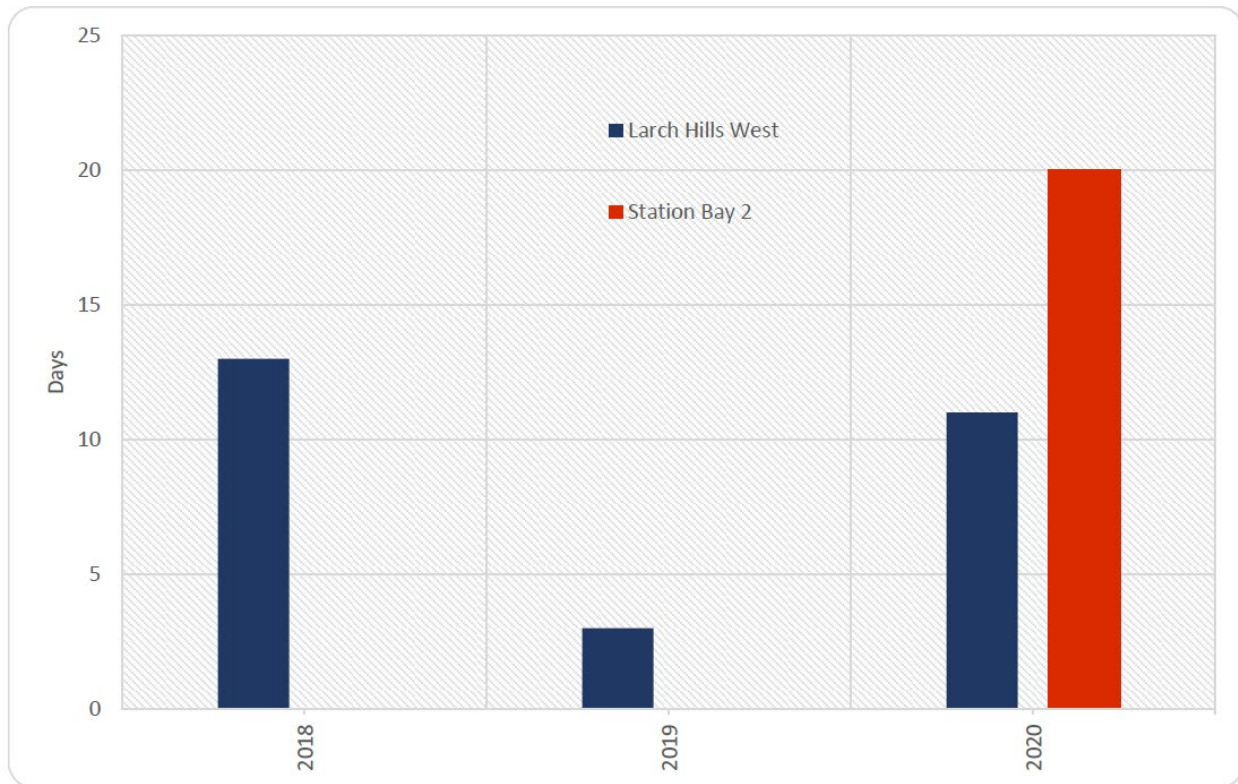
Figure 12: BC Wildfire Service Larch Hills West (2018-2020) and Station Bay 2 (2019-2020) weather station Danger Class 4 graph (no Class 5 days).

To gain a further understanding of fire weather trends, the daily severity rating (DSR) was calculated for all weather observations using the following formula from Harvey, Alexander & Janz (1986):

DSR = $0.0272*(FWI)^{1.77}$

where FWI is the daily value.

The DSR values have been summed and averaged to calculate the seasonal severity rating (SSR) for each weather station. In order to obtain meaningful results, each dataset was reviewed to define Fire Season dates for the analysis. Most of the weather stations contained enough comprehensive data to calculate annual SSR for a defined Fire Season of April 25th to October 10th. Weather stations Curwen Creek and Kettle 2 were analysed based on a defined Fire Season of June 1st to October 10th, due to lack of early fire season data.
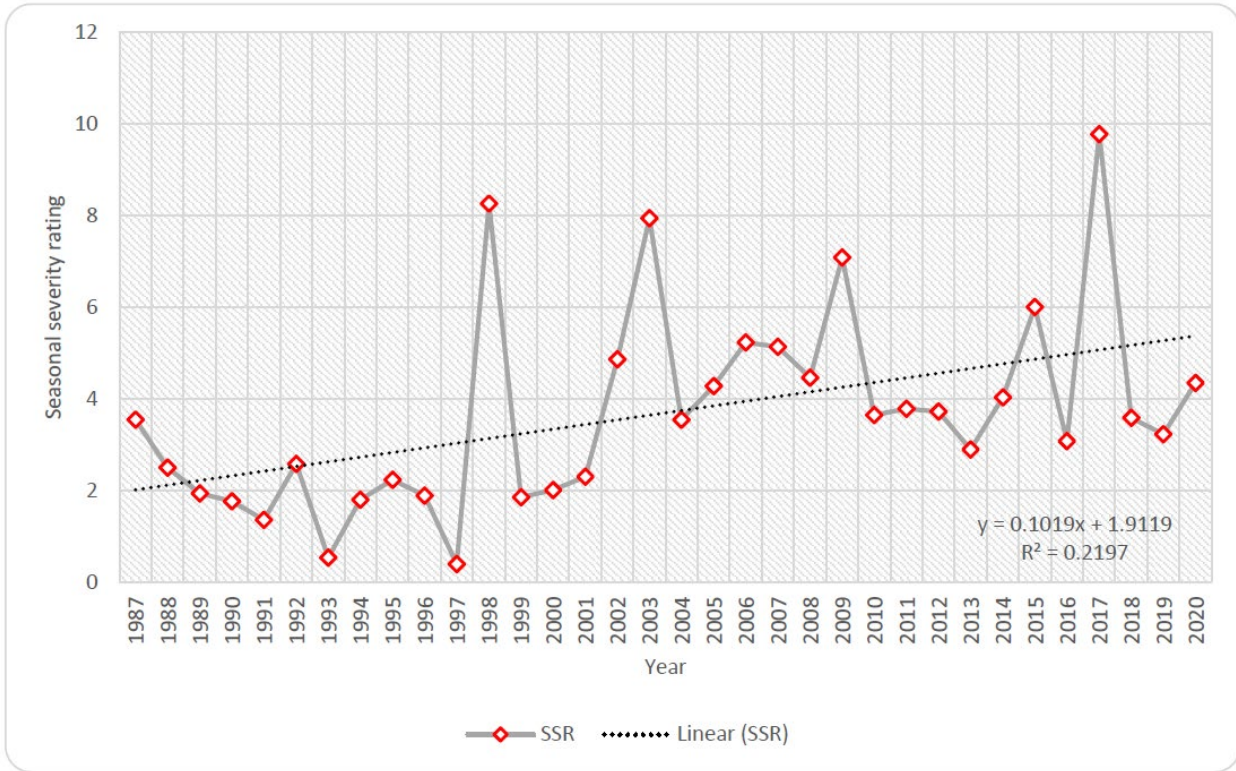
Figure 13: Seasonal severity rating for Mabel Lake 2 weather station (1987-2020).
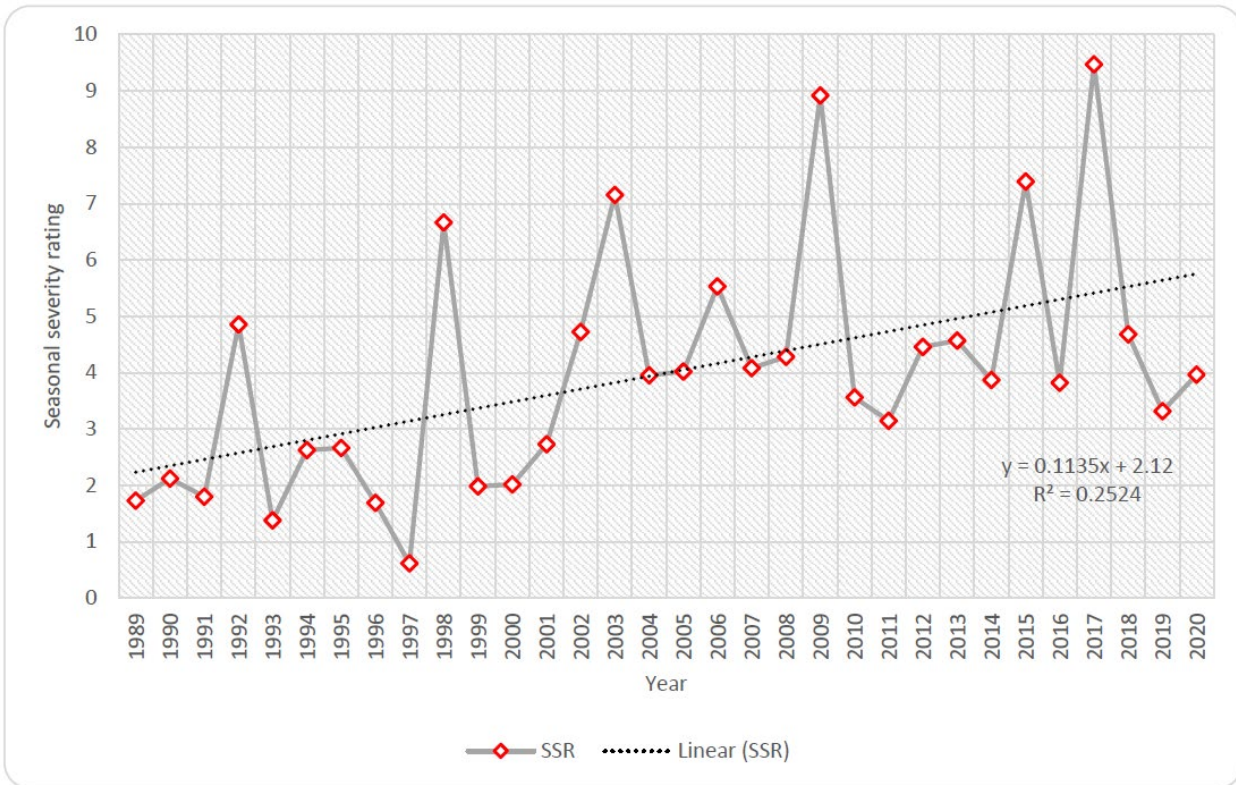
Figure 14: Seasonal severity rating for Salmon Arm weather station (1989-2020).
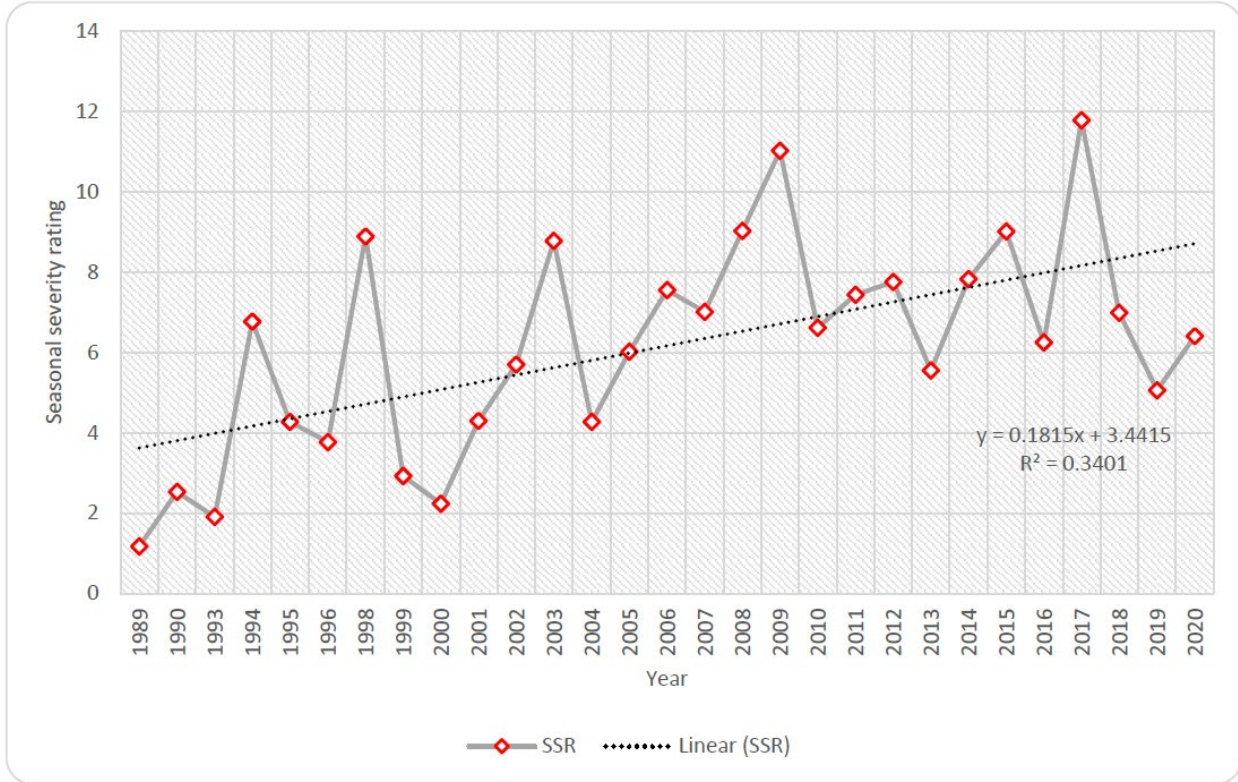
Figure 15:Seasonal severity rating for Fintry weather station (1989-2020).
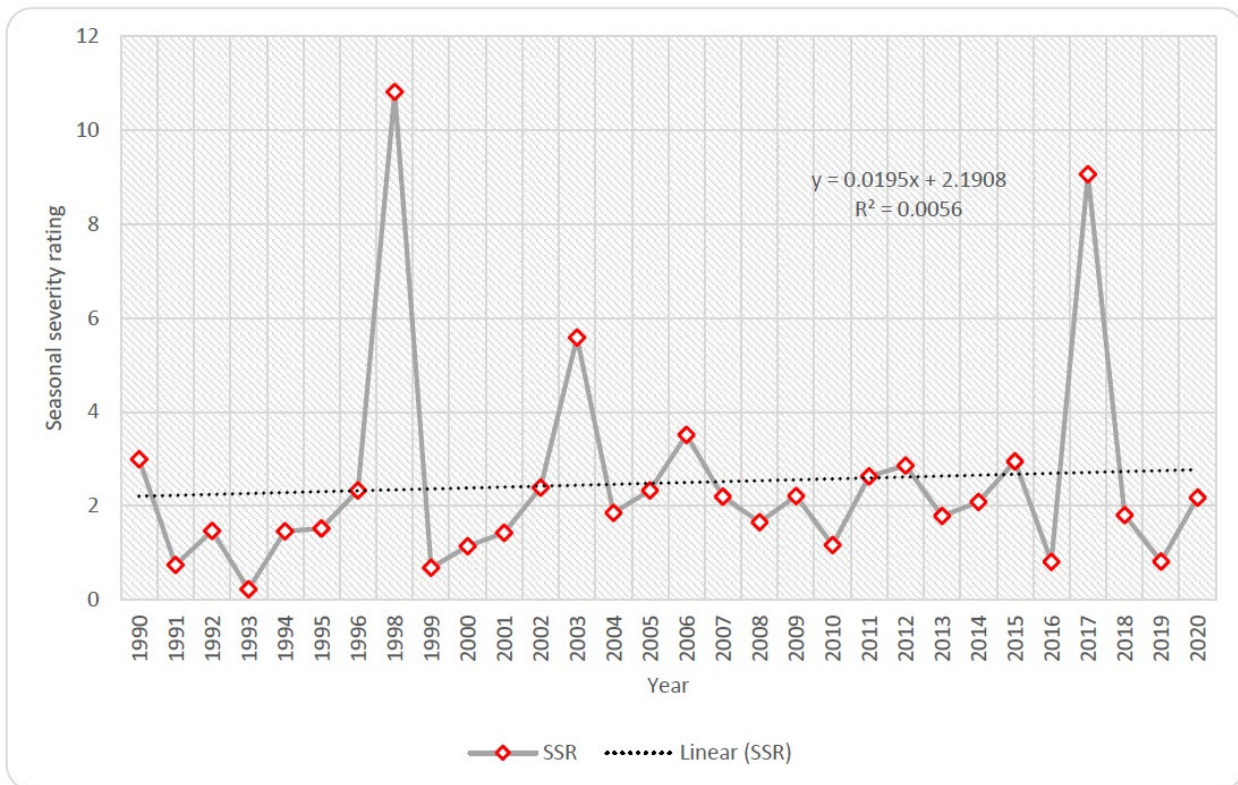
Figure 16: Seasonal severity rating for Curwen Creek weather station (1990-2020).
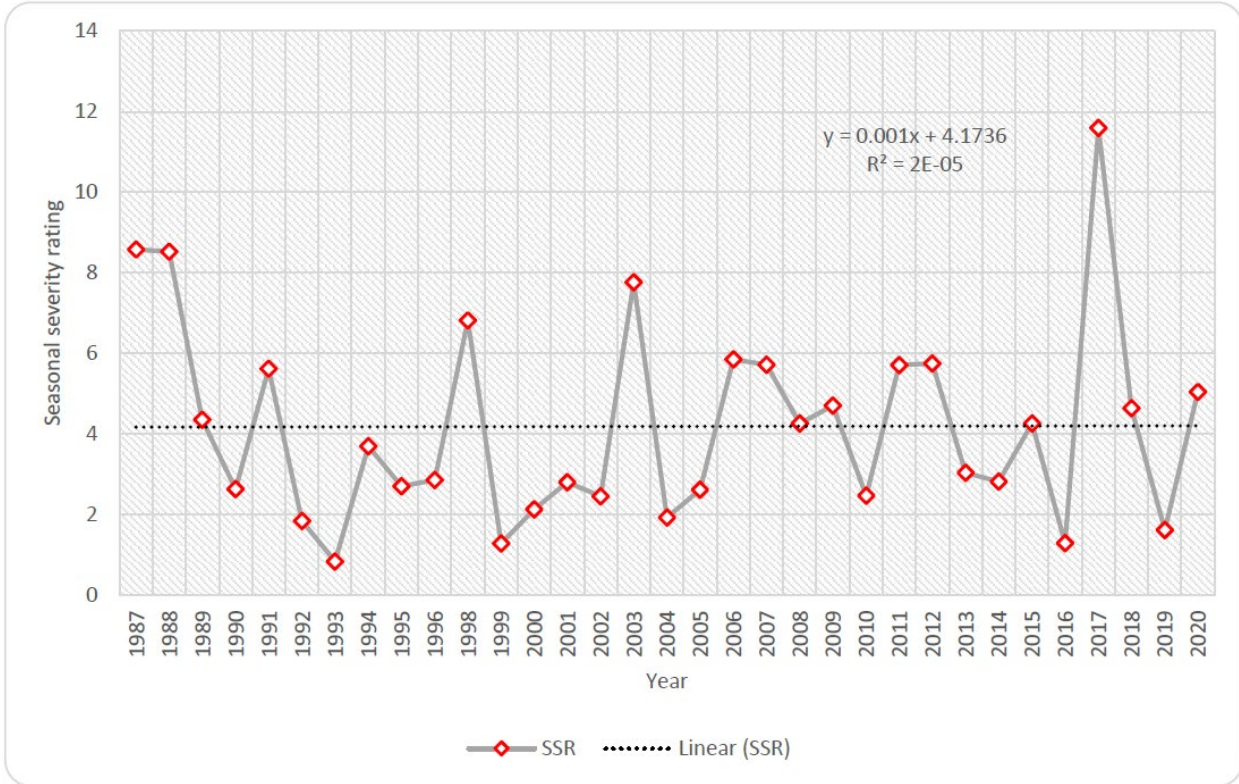
Figure 17: Seasonal severity rating for Kettle 2 weather station (1987-2020).
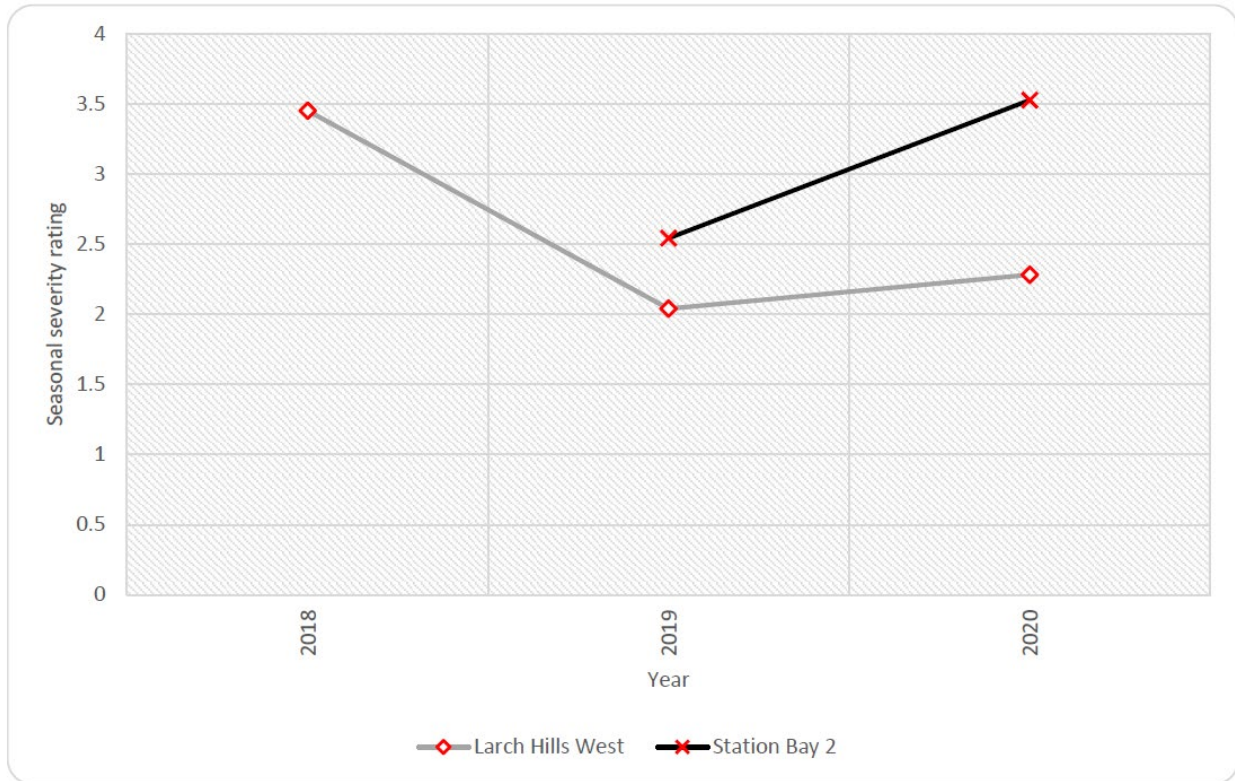
Figure 18: Seasonal severity rating for Larch Hills West (2018-2020) and Station Bay 2 (2019-2020) weather stations.

4.1.2 Climate Change

Climate change projections point to a warmer, drier environment, and shifts in vegetation with the following implications in some areas of the province:

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

As a result, some existing forests have an increased probability of more frequent, intense, and more difficult to control wildfires that are likely to result in increased tree mortality, detrimental impacts to soils and hydrology, and increased threat to community and interface areas.

The regional climate service centre for the Pacific and Yukon Regions, located at the University of Victoria, is called the Pacific Climate Impacts Consortium (PCIC). This non-profit corporation "conducts quantitative studies on the impacts of climate change and climate variability" (PCIC, 2021a). Findings from these studies are incorporated into practical tools for end-user application. For example, the PCIC website offers a map-based data portal for downloading information, analysis tools for the various regions in BC (Plan2Adapt, Climate Explorer, and seasonal anomaly maps), downloadable publications, and software for climate data interpretation.

Projected climate change data available from the PCIC present a comprehensive view of potential climate change risks and impacts, due to inputs from a multitude of raw data sources. The Plan2Adapt tool lists potential climate impacts for the North Okanagan in the 2050s, including the following key points (PCIC, 2021b):

- Overall increase in hot and dry conditions
- Considerable increase in frequency and occurrence of high temperatures
- Longer dry season, affecting availability of water sources for fire fighting
- High intensity precipitation
- Decrease in snowpack
- Possible changes in vegetation productivity
- Potential increase in forest damage from pests and insects

Table 17 presents a summary of projected changes in average temperature and precipitation for the North Okanagan (PCIC, 2021b). This illustrates the likely increase in annual temperature, with less precipitation in summer, and more in winter.

Climate change impacts will likely result in more frequent, and more intense wildfires. Higher temperatures, with reduced precipitation during the wildfire season, may cause dry ecosystems to become drier, as well as move to higher elevations and further north. Increased forest damage and tree mortality also increase the fuel loading available to burn. Furthermore, some forests may gradually shift to grasslands. Long term effects of this shift could cause high-intensity fires to burn further upslope, away from communities in the valley bottom. In the short term, forest mortality would likely increase fire hazard, due to increased dead and downed fuel loading.

Table 17: Summary of projected changes in average temperature and precipitation in the RDNO to the 2050s

Climate Variable	Season	Projected Change from 1961-1990 Baseline	
		Ensemble Median	Range (10th to 90th percentile)
Temperature (°C)	Annual	+3.2 °C	+2.1 °C to +4.2 °C
Precipitation (%)	Annual	+0.13%	-2.1% to +7.2%
	Summer	-7.7%	-33% to +0.81%
	Winter	+3.5%	-1.1% to +8.3%

This table shows projected changes in average (mean) temperature, precipitation, and several derived climate variables from the baseline historical period (1961-1990) to the 2050s (2040-2069) for the North Okanagan region. The ensemble median is a mid-point value, chosen from a PCIC standard set of Global Climate Model (GCM) projections (see the 'Notes' tab in (PCIC, 2021b) for more information). The range values represent the lowest and highest results within the set. This table has been adapted from the Pacific Climate Impacts Consortium, Plan2Adapt suite of climate change and adaptation tools, available here: https://www.pacificclimate.org/

4.2 Provincial Strategic Threat Analysis (PSTA)

The PSTA and Risk Class framework are provincial level GIS analyses which provide a starting point to assess local wildfire threat. The PSTA utilizes and interprets provincial fuel type mapping, historical fire occurrence data, topography, and historical weather station data to produce a wildfire threat score. Outputs of the PSTA include information and maps describing fuel types, historical fire density, potential for embers to land in an area (spotting impact), head fire intensity, and the final wildfire threat. Details regarding how the PSTA dataset was derived can be found through the BCWS, and BC Government Warehouse Data Catalogue websites (BCWS, 2020; 2021a).

Due to the large-scale limitations of the PSTA, a local GIS-based potential fire behaviour/threat analysis was also conducted, utilizing local factors that improve modelled fire behaviour accuracies. Wildfire threat is directly related to the likelihood of hazardous fuel igniting (fire history factors), and wildfire spreading directly into the community (head fire intensity), or through ember transport (spotting impact). The wildfire threat assessment described in sub-section 4.3 was carried out based on results from the PSTA, and the local analysis to produce better quality results.

The PSTA wildfire threat ratings for the AOI were analysed, and are summarised in Table 18. Private land and private managed forest land are not included in the PSTA data, accounting for 34% of the area. Most of the threat ratings on public land were in the high (29%) and moderate (24%) categories.

The potential fire behaviour data, derived from the local GIS-based analysis, were also analysed for the AOI, and are summarised in Table 19. According to the local analysis, most of the fire behaviour categories fell into extreme (29%), and low (13%). The areas containing no data, made up of private, Indian Reserve, and unknown ownership categories, did not match between the local analysis, and the PSTA (1,847 ha more in the local analysis), but were close enough to enable comparison between the two summaries (Table 18 and Table 19). In terms of public land, the local analysis resulted in 21% more in extreme, 22% less in high, 13% less in

moderate, and 11% more in low. The PSTA has a water category, rather than a very low category. When categories of extreme and high are added together, the percentages are similar, with 37% for the PSTA, and 36% for the local analysis. This implies that the local analysis was able to highlight the areas with extreme fire behaviour, primarily due to local weather conditions affecting the AOI.

Table 18: PSTA threat rating category areas and percentages for the AOI

PSTA Threat Rating	Area (Ha)	%
Extreme	7,584	8%
High	27,874	29%
Moderate	23,670	24%
Low	1,848	2%
No Data (Private Land)	32,643	34%
No Data (Private Managed Forest Land)	69	0.1%
Water	3,258	3%
Total:	**96,946**	**100%**

Table 19: Local GIS-based analysis of potential fire behaviour category areas and percentages for the AOI

Fire Behaviour	Area (Ha)	%
Extreme	28,381	29%
High	6,931	7%
Moderate	10,924	11%
Low	12,312	13%
Very Low	3,839	4%
NO DATA	34,559	36%
Total:	**96,946**	**100%**

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. The potential for very large, destructive, and landscape-altering fires is related to historical fire characteristics and fire response patterns within a given planning unit. Although the location of future ignitions is difficult to predict, a review of historical fire ignitions and spread can reveal patterns that have a greater likelihood of occurring in the future.

Fire history data was obtained from the BC Government Warehouse, as collected and maintained by the BCWS. Point data includes fires from 1950-2020. Polygon data includes fires from 1919-2020, although prior to 1950, the data is limited to fires with large perimeters. Historic wildfire data within the RDNO shows a vast array of occurrences across the entire landscape. The CWPP AOI is no different. Data analysis included all point and polygon data within a 2 km buffer from the AOI. Fire history records outside the AOI boundary were included because fires outside the WUI often impact communities with evacuation alerts or orders, and stronger concentrations of harmful smoke.

The fire history dataset provides a general idea of trends in an area; although, there are often discrepancies between the information for wildfire points and perimeters, and sometimes there are errors in location. Regardless, the data paints a picture of overall fire history for the AOI.

Figure 19 depicts an old burned-out cedar in Tolley Park, next to Mabel Lake Community Hall. There were no records of this fire in the fire history dataset, so if this was a small fire, it likely occurred prior to 1950.

Figure 19: Remnant of a burned-out Western Red Cedar in Tolley Park next to Mabel Lake Community Hall

Point fire history data indicate that since 1950, 1075 wildfires were recorded within 2 km of the CWPP AOI. Of these, 513 or 48% were lightning-caused, 541 or 50% were person-caused, and 21 or 2% were listed as unknown cause. Table 20 summarises fire causes, total fires, annual average, percent of total fires in each cause category, the maximum number of fires in one year, and the years the maximum occurred. These summaries were broken down by RDNO Area, and adjacent jurisdictions within the 2 km buffer. Areas D and E indicate that about half of all fires were caused by lightning, and half by a person. Area F differs where 60% were caused by a person, and at least 37% were caused by lightning (3% were listed as unknown cause). This analysis also shows that the highest fire occurrences were in 1970, 1973, 1984, and 1987. Table 21 provides a summary of the total area burned within the 2 km AOI buffer by fire cause,

including the maximum area burned in one year, and the year the maximum occurred. Lightning accounted for 75% of all burned areas, with only 25% caused by a person. The most area burned in a single year was in 1929, by lightning, whereas the most area burned in a single year by people was in 1925.

Annual wildfire occurrence within 2 km of the AOI was graphed from 1950 to 2020 (Figure 20). Generally, there have been between 4 and 10 of both lightning- and person-caused wildfires each year, with spikes in 1952, 1967, 1970, 1973, 1984, 1987, and 1992. Both lightning- and person-caused wildfires are trending downward in this plan area, person-caused more so than lightning-caused. Annual area burned within 2 km of the AOI was graphed from 1919 to 2020 (Figure 20). There is one clear spike in the late 1920s, depicting the 5,685 ha that burned from lightning causes. Between 1967 and 1974, another small spike in area burned is evident, with top annual areas burned between 130 ha and 560 ha. Within the AOI and 2 km buffer, the graph clearly shows that over the last century, total area burned from lightning causes is much higher than total area burned from human causes.

Table 20: Wildfire occurrence summary within 2 km of the AOI, 1950-2020, broken down by Area/District, and total

Cause	2 km AOI Buffer - RDNO Fire Point History 1950 - 2020 (including adjacent jurisdictions)																				
	Area D			Area E			Area F			Area C			Columbia Shuswap Regional District			District Municipality of Spallumcheen			Total in 2 km AOI Buffer		
	Lightning	Person	All~	Lightning	Person	All~	Lightning	Person	All~	Lightning	Person	All	Lightning	Person	All~	Lightning	Person	All	Lightning	Person	All~
Total Fires^	258	200	467	143	140	286	78	128	213	4	3	7	23	53	78	7	17	24	513	541	1075
Annual Average	3.6	2.8	6.6	2	2	4	1.1	1.8	3.0	0.06	0.04	0.10	0.3	0.7	1.1	0.1	0.2	0.3	7.3	7.6	15.1
% of Cause	55%	43%	100%	50%	49%	100%	37%	60%	100%	57%	43%	100%	29%	68%	100%	29%	71%	100%	48%	50%	100%
Maximum # in one year	20	10	29	13	9	17	5	7	11	1	1	1	2	5	5	1	3	3	29	27	56
Years of Maximum	1970	1973	1970	1970	1970	1987	1967 1979 2006	1970	1970	1965 1970 1971 1972	1951 1952 1984	All years listed to left	1961 1965 1994	1952	1952 1954	1955 1957 1960 1963 1970 1971 1990	1992	1963 1992	1970 1984	1970	1970

^Total Fire numbers do not include fire types of nuisance, smoke chase, duplicate, etc.
~All fire causes include lightning, person, and unknown.

Table 21: Total wildfire area burned within 2 km of the AOI, 1919-2020

	Area burned* within 2 km AOI Buffer - RDNO Fire Area History 1919 - 2020		
	Lightning	Person	All (Lightning + Person)
Total Area (ha)	11,735	4,004	15,739
Maximum	5,685	835	6,338
Year of Maximum	1929	1925	1929

* Fire perimeters were cross-referenced and combined with point data. Fire perimeter data was clipped to a 2 km AOI buffer. Portions of fires beyond the 2 km buffer have been omitted from the analysis.
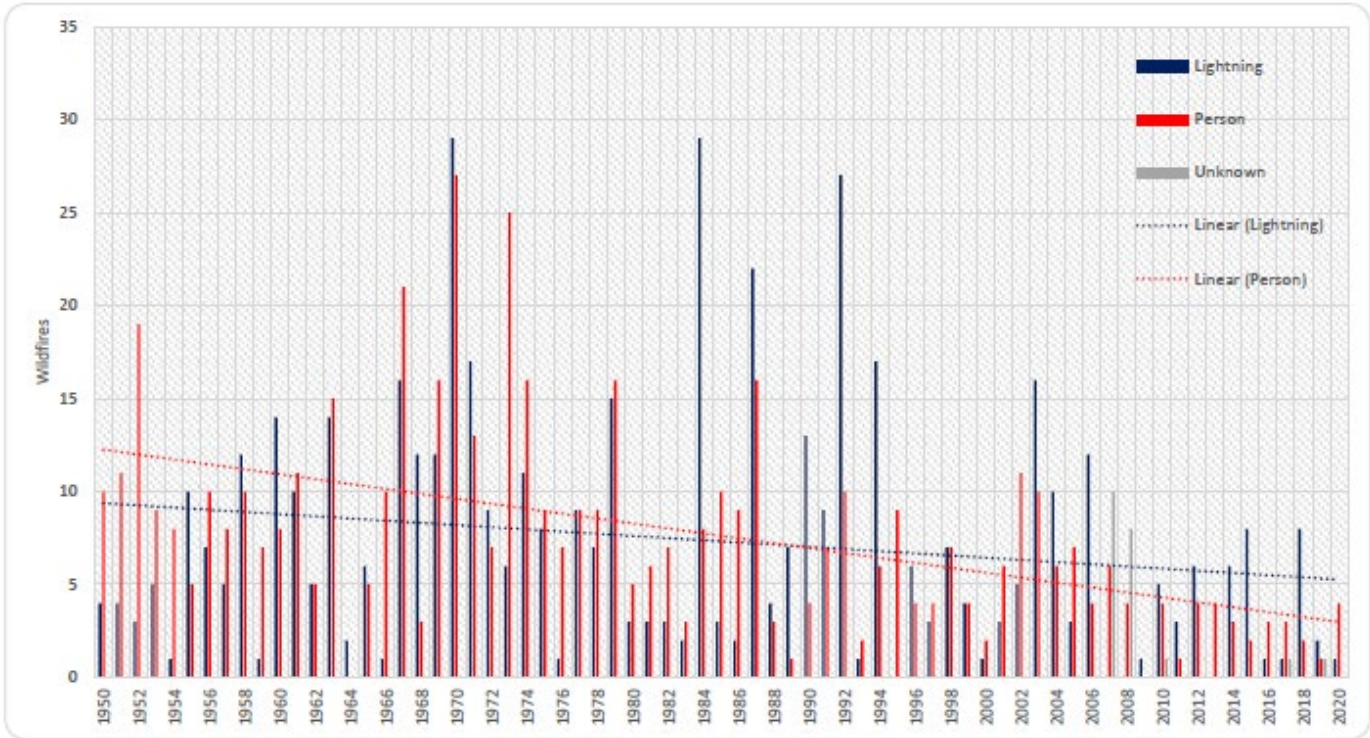
Figure 20: Annual wildfire occurrence within 2 km of the AOI, from 1950-2020
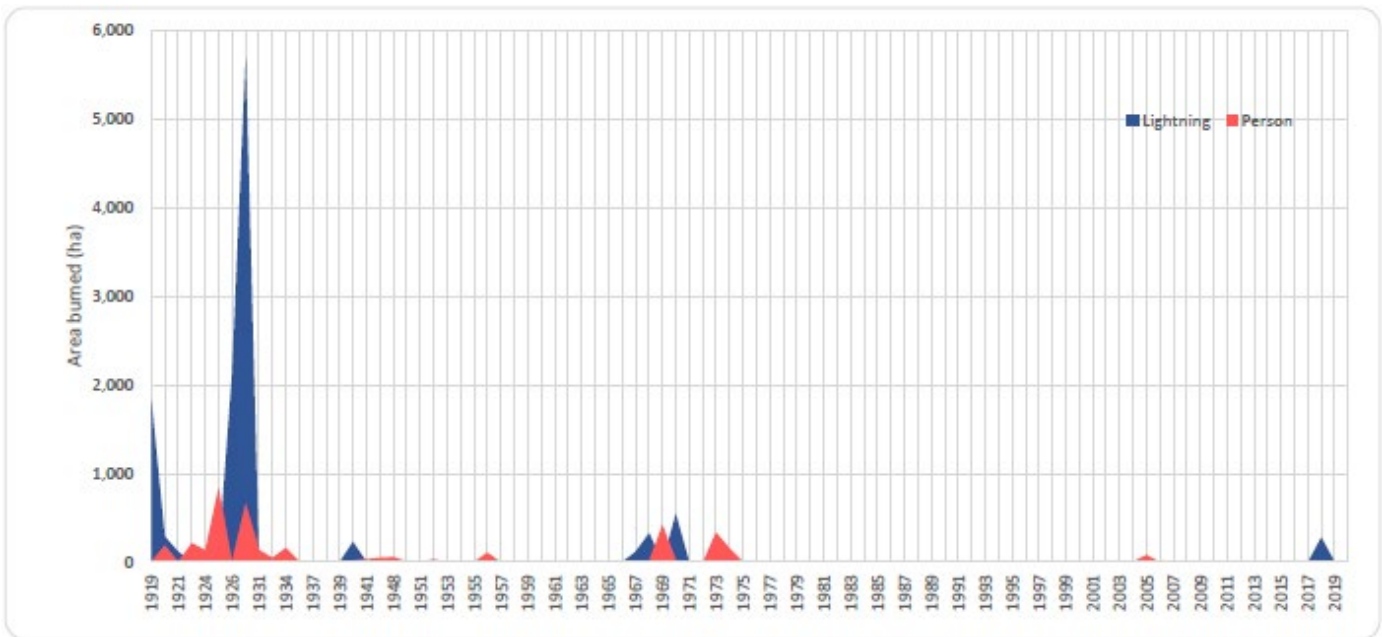
Figure 21: Annual area burned from wildfire within 2 km of the AOI, from 1919 to 2020

The 2018 RDNO CWPP update included an expanded fire history analysis (Davies Wildfire Management Inc., January 2019). This included a wildfire occurrence graph for all electoral areas in the RDNO from 1950-2018, two annual area burned graphs for all electoral areas in the

RDNO from 1919-2018, a wildfire occurrence graph for all of BC from 1950-2018, and an annual area burned graph for all of BC from 1918-2018. A couple of key trends for the last 70 years were observed: 1) person-caused wildfires have been declining; and 2) lightning-caused wildfires have been increasing. Although outreach campaigns can educate the public about fire prevention, and reduce the number of person-caused wildfires, the increase in lightning-caused wildfires is difficult to manage, and could be affected by climate change. The apparent increase in lightning-caused wildfires, may be attributed to improved fire-detection capabilities over time.

4.3 Local Wildfire Threat Assessment

The local wildfire threat assessment for this CWPP AOI followed the 2012 WUI Wildfire Threat Assessment guide methodology (Morrow, Johnston, & Davies, 2012). Plot locations were selected through GIS analysis, and fire behaviour prediction (FBP) modeling of the provincial fuel type layer. Polygon outputs were filtered to identify the highest priority areas for field assessment. Specific criteria selected polygons with a modelled fire behaviour rating of Moderate or higher that were within 100 m of a structure within the WUI. This produced 166 polygons that were further examined on Google Earth prior to conducting field work.

Detailed methodology and results of the local wildfire threat assessment is provided in Appendix 2. This includes field reviewed fuel characteristics, proximity of fuel to the community, local fire spread patterns, topographical considerations, further classifications, local factors, and further summaries.

The Wildfire Threat Assessment Worksheets and photos are provided in Appendix 3 as a separate attachment.

SECTION 5: Risk Management and Mitigation Factors

Wildfire risk can be defined as the probability of a fire occurring, multiplied by the consequence of that fire to community values. Risk mitigation choices may vary by community, fuel type, ecology, hazard, terrain factors, land ownership, other unique local risk factors, local government capacity, and/or public acceptance. Included recommendations are intended to meet community needs and build resiliency to potential wildfire impacts.

Mitigating wildfire risk is a proactive approach to reducing potential impacts and subsequent losses from devastating wildfires, and is best conducted in a coordinated fashion amongst applicable land managers and/or owners, such as provincial and federal governments, local governments, First Nations, and private landowners. Understanding and assessing all applicable risks that apply to a community are vital for determining actions that the RDNO can undertake to mitigate and manage wildfire risk within and adjacent to their jurisdiction.

Many different risk mitigation options are available, including:

> 5.1 Fuel Management – reduce fire behaviour potential
> 5.2 FireSmart – reduce fire spread into community and impacts to values
> 5.3 Communication and Education – reduce fire occurrence
> 5.4 Other Preventative Measures

Sub-section 4.2.1 illustrated that wildfire cause within the AOI tends to be evenly split between lightning and humans. This highlights the need to use multiple strategies and tactics to manage WUI threat. Education and prevention programs may effectively reduce the number of human-caused fires; however, lightning storms can not be controlled, so reducing the consequence of fires is equally important through fuel management and FireSmart actions.

5.1 Fuel Management

The intent of this sub-section is to conduct more detailed work on the highest local risk areas of the WUI identified in Section 4.3, and design logical treatment units for future prescription development and fuel management treatments within areas identified as having the highest risk.

Based on the local wildfire threat assessment, eight logical fuel treatment units have been designed for fuel management treatments within and adjacent to the AOI (see Table 22 for a summary). Proposed treatments have been organised in terms of priority, in alignment with the total wildfire threat scores from associated reference plots. Overall, treatment areas cover 332.7 ha within the CWPP AOI. All treatments are proposed for crown land, except polygon ID #5, which is located on RDNO municipal land.

Fuel treatment units (FTUs) propose to modify fire behaviour and create better options for fire suppression. Several key principles were considered during FTU development, including unit continuity, relatively linear shape, anchoring to non-fuel areas, accessibility, defensibility, and a design to effectively change fire behaviour from a crown fire to a surface fire during 90th percentile fire weather conditions for the local area. Additional criteria aimed to ensure proposed treatments are sufficient in size, and strategically located with boundaries that can be effectively utilized for wildfire response. Boundaries are consistent with logical burn unit planning principles of utilizing topographical breaks, and man-made / natural features of roads, railways, hydro transmission lines, gas pipelines, wetlands, lakes, irrigated fields, non-fuel areas, etc.. Fuel treatment design also considered constrained areas (i.e. private land, constraints that preclude treatment), and treatment method (commercial timber harvest, mechanical, prescribed fire, etc.).

Each fuel treatment unit has been uniquely identified with a polygon ID. All FTUs are tied to the same fire management objective: to conduct fuel treatments to create residual stand characteristics that do not support an active crown fire. Various treatment methods could be utilized to meet the objective, in conjunction with treatment intensity and timing, site sensitivity, public support, and any unique site-specific requirements.

Hand crews are commonly utilised to thin and prune FTUs with tools such as power saws, brush saws, pole pruners, etc.. Debris can be either piled and burned, chipped, and/or hauled away. Due to the intense physical labour required for hand treatments, they are recommended for sites with thin, sensitive soils that would be adversely affected by ground-based mechanized equipment.

Where possible, feller bunchers and excavators with various mulching heads may be used to carry out treatments. Conventional timber harvesting may help recover costs through log utilisation. Production rates may increase when supplemented with machinery, versus treating with hand crews alone. However, soil disturbance is much higher with mechanized equipment, meaning that highly sensitive sites would be limited to hand crew treatment methods.

Fuel treatment may result in higher levels of surface fuels in the unit, especially fine fuels. If fine fuels are exacerbated by treatment, they should be managed by a feasible method such as low-intensity prescribed fire. Ecological effects from prescribed fire tend to be beneficial on sites selected for treatment.

Proposed treatment areas should be treated, and maintained to ensure effectiveness, and continued adherence to the fire management objective. It is recommended to schedule periodic site checks for determining when to schedule maintenance treatments. This is especially important for NDT4 sites, which will eventually return to pre-treatment structure if not maintained.

Each FTU has been categorised into interface, and landscape fuel breaks (see Table 22). Interface fuel breaks in the WUI are located adjacent to important values requiring protection, such as public buildings, recreation sites, and private property. They tend to cover the WUI 100 zone, and have been designed to incorporate natural features that will help to modify potential fire behaviour. To realise the full potential of interface fuel breaks, adjacent buildings should adhere to FireSmart principals. Landscape level fuel breaks tend to extend beyond the WUI 100 zone, creating larger-scale breaks that reduce the likelihood of a crown fire adjacent to community structures and access / escape routes.

Table 22: Proposed Fuel Treatment Unit (FTU) summary table

Priority Rank	FTU Polygon ID	Reference Plot	Area (ha)	Wildfire Behaviour Threat Class	Wildfire Behaviour Threat Class Score	WUI Threat Class	WUI Threat Class Score	Total Wildfire Threat Score	Geographic Area	Feature Type
Priority 1	1	RDNO018	5.8	HIGH	133	EXTREME	50	183	Larch Hills X-Country Ski Area	Interface Fuel Break
Priority 2	6	RDNO003	14.2	HIGH	136	EXTREME	40	176	Cherryville Museum and Gold Panner Campground	Interface Fuel Break
Priority 3*	5	RDNO004	5.7	MOD	88	MOD	N/A	N/A	Cherryville Elementary School*	Interface Fuel Break
Priority 4**	3	RDNO007	82.8	HIGH	132	HIGH	30	162	Sugar Lake 2-Mile**	Landscape Fuel Break
Priority 5	2	RDNO009	65.7	HIGH	124	HIGH	30	154	Mabel Lake Access: Mabel-Taylor FSR	Landscape Fuel Break
Priority 6	8	RDNO015	13.8	HIGH	118	HIGH	35	153	Echo Lake	Interface Fuel Break
Priority 7	7	RDNO013	105.9	HIGH	118	HIGH	30	148	Harris Rd	Landscape Fuel Break
Priority 8	4	RDNO006	38.8	HIGH	100	HIGH	35	135	Cherryville Rec Site	Interface Fuel Break
		Total Area:	332.7							

* Cherryville Elementary School is the only proposed FTU located on RDNO municipal land. All other polygons are located on Crown land.
** Sugar Lake 2-Mile should extend past the AOI to receive the most benefit from treatment. An additional 3.6 ha beyond the AOI should be included at the treatment stage, for a total area of 86.4 ha (Figure 24).

Two proposed FTU require further explanation: Cherryville Elementary School (FTU 5, Priority Rank 3) and Sugar Lake 2-Mile (FTU 3, Priority Rank 4).

The Cherryville Elementary School FTU covers 5.7 ha of forested areas surrounding the school, and Hanson Park, on the lower side, or north of North Fork Road (see Figure 22). The area has been partially treated, but would benefit from further treatment. The wildfire behaviour threat score is less than 95 in reference plot RDNO004, so the WUI threat score is not applicable in

this case. The WUI threat class is defaulted to moderate to be in alignment with the wildfire behaviour threat class.

The Cherryville Elementary School has been ranked as priority 3 because it is a relatively small treatment area representing an excellent FireSmart example for the community. After treatment, recommend erecting educational signs next to the roadside picnic tables to further enhance the wildfire mitigation work (see Figure 23). The treatment area would tie into community communication and education, in a visible location that is frequently visited by Cherryville residents.

Figure 22: Proposed FTU 5 surrounding Cherryville Elementary School and Hansen Park – the FTU is delineated by yellow hatching, and the adjacent grey hatching delineates private land

Date & Time: Mon, May 17, 2021, 14:34:49 PDT
Position: 11 N 384779 5567094 (±5.0m)
Altitude: 534m (±8.0m)
Datum: WGS-84
Azimuth/Bearing: 149° S31E 2649mils True (±20°)
Elevation Grade: -016%
Horizon Grade: +006%
Zoom: 1.0X

Figure 23: Rest area across from Cherryville Elementary School at reference plot RDNO004

The Sugar Lake 2-Mile FTU covers 82.8 ha within the AOI; however, an additional 3.6 ha north of the AOI boundary should be included in the treatment area to create an effective landscape fuel break and safe egress. The entire FTU would cover 86.4 ha in total, with boundaries adjacent to gravel roads, Sugar Lake, and Sugar Lake 2-Mile Campground (Figure 24). The current fuel structure within the FTU is depicted in Figure 25, with dense stems, and moderate to high surface fuel levels. Treatment should focus on thinning and removing surface fuel loading, which would significantly reduce fire intensity, should a wildfire occur in the area.

Of the 166 polygons produced during the GIS analysis step for the local wildfire threat assessment, 134 covered less than one hectare. Many of these were roadside slivers adjacent to private land. These areas would be best managed through a partnership between the RDNO and the Ministry of Transportation and Infrastructure (MoTI). Recommend establishing an agreement to support wildland fuel management and roadside vegetation control, as well as best practices for limiting hazardous roadside vegetation during the fire season.
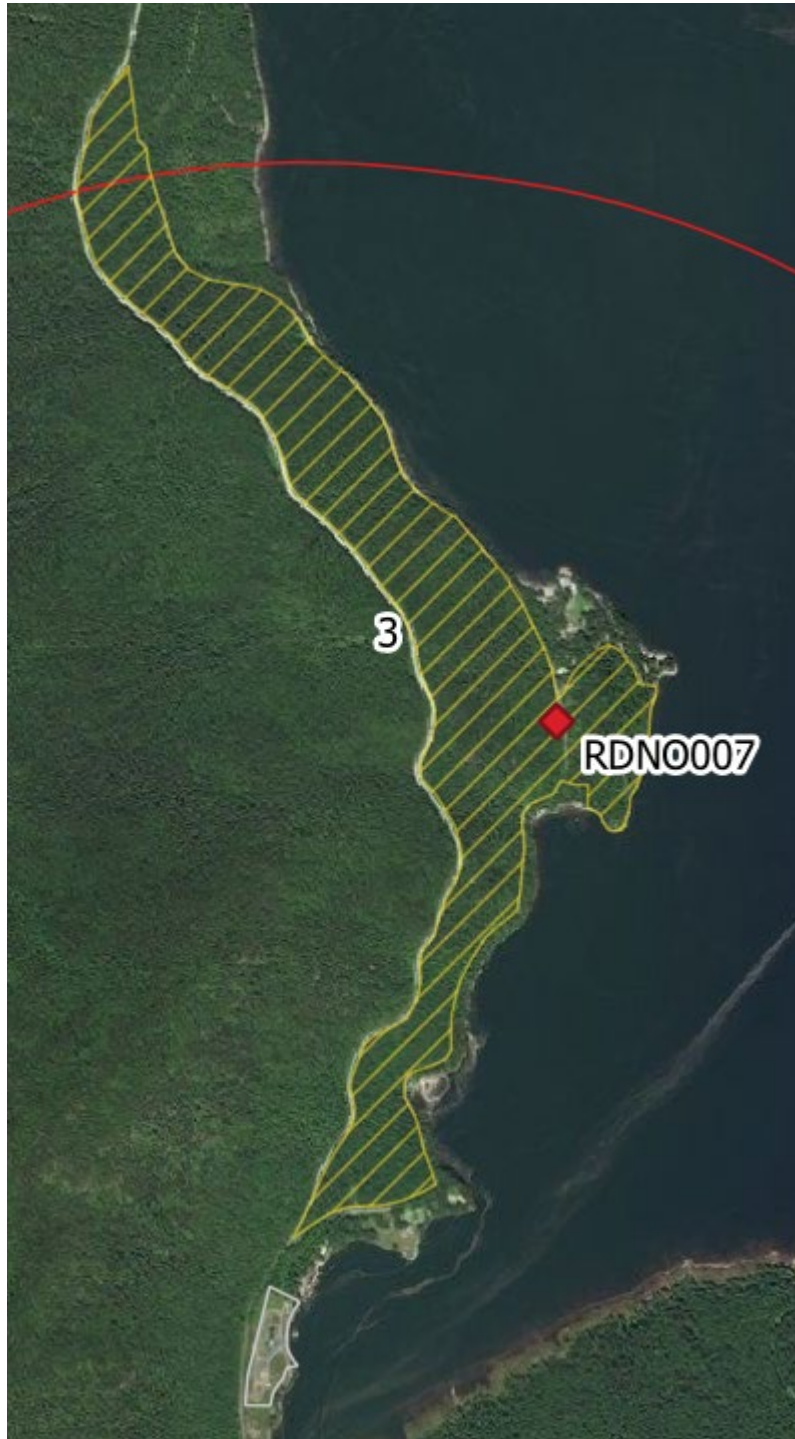
Figure 24: Sugar Lake 2-Mile proposed FTU 3, showing the full extent beyond the AOI (red line) in yellow hatching

Figure 25: Typical fuel structure within the Sugar Lake 2-Mile FTU, with dense stems and moderate to high surface fuel levels

5.2 FireSmart Planning & Activities

The intent of this sub-section is to summarize the current level of FireSmart that has been completed, or is under implementation, to identify areas that are FireSmart, or have received FireSmart recognition through the FireSmart Canada Recognition Program, and to identify future FireSmart activities within the AOI.

As of 2021, the Canadian Interagency Forest Fire Centre became the owner and administer of the FireSmart Canada program[1] (FireSmart Canada, 2021). Partners in Protection, a national non-profit association comprised of national, provincial, and local government agencies with fire protection mandates, created the FireSmart brand in 1999, and ran the program for over 20

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[1] In BC, FireSmart is governed by multiple agencies, committed to aligning with FireSmart Canada
https://firesmartbc.ca/who-we-are/

years. 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 from existing communities, as well as guide new development. Although the FireSmart program is primarily focused on residential homes, principles have been adapted for application in mixed-use areas, industrial activities, and elsewhere. For this reason, the terms structure or building are just as appropriate and applicable as home or house when referring to FireSmart principles.

5.2.1 FireSmart Goals & Objectives

The two overarching goals of FireSmart are "to improve communication with stakeholders, and to organize programs and assets into a logical, manageable structure based on three pillars – homeowners, neighbourhoods, and communities" (FireSmart Canada, 2021). In general terms, FireSmart aims to encourage communities and citizens to adopt and conduct FireSmart practices which will mitigate negative impacts of wildfire to assets on public and private property. Findings from a study of the May 1st, 2016 Horse River wildfire in Fort McMurray indicate that adhering to FireSmart principles was one of the main reasons why individual homes survived, regardless of the broader wildfire threat surrounding them – true in both the urban and rural areas (Westhaver, 2017).

FireSmart encourages homeowners to complete FireSmart practices on their property to minimize fire hazard, and reduce potential damages from wildfire. FireSmart actions and objectives include:

- Reducing the potential for an active crown fire to move through private land
- Reducing the potential for ember transport through private land and structures
- Creating landscape conditions around properties where fire suppression efforts can be effective and safe for responders and resources
- Treating fuel adjacent and nearby to structures to reduce the probability of ignition from radiant heat, direct flame contact, and ember transport
- Implementing measures to structures / assets that reduce the probability of ignition and loss

FireSmart has identified four zones around a building (see Figure 26), alongside descriptions of what these zones should look like, starting from the edge of a building and moving outwards (BCWS, 2019):

- **Non-combustible Zone (0 - 1.5 m)** – No flammable materials around the buildings and attachments such as decks
- **Zone 1 (1.5 - 10 m)** – A fire-resistant zone free of easily ignitable materials
- **Zone 2 (10 - 30 m)** – Thinned and pruned coniferous trees, alongside routine dead surface fuel clean-up
- **Zone 3 (30 - 100 m)** – Opportunities for creating fire breaks and additional thinning / pruning

Communities are often characterised by homes and buildings that are situated close together. This means that FireSmart Zones frequently overlap one another (i.e., Zone 2 from one building may encroach into Zone 1 from an adjacent building). This highlights the importance of community resilience towards wildfire though working together to reduce wildfire hazard, especially in the WUI.
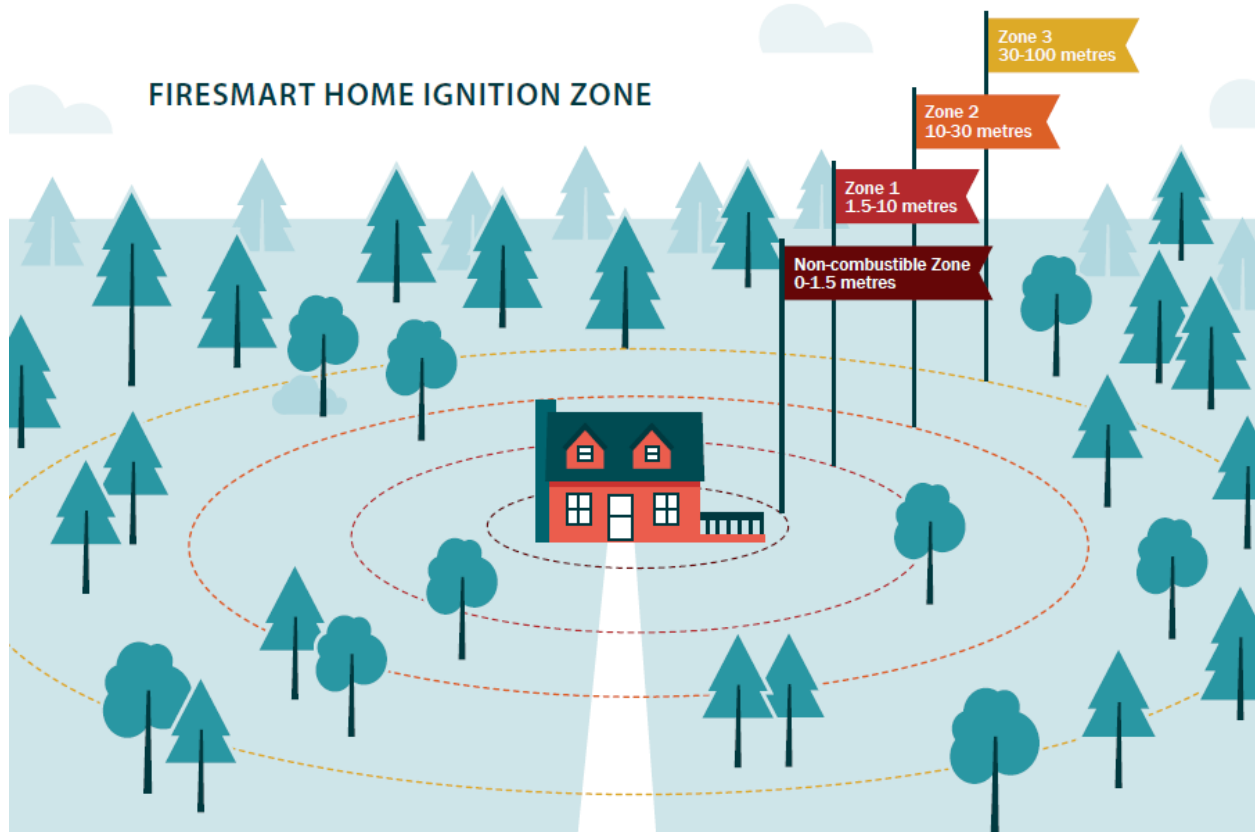
Figure 26: Home ignition zones, as illustrated by the BC FireSmart Begins at Home Manual (BCWS, 2019)

Mitigation actions such as landscape and interface fuel treatments are most effective in combination with site-specific FireSmart actions surrounding structures. Neighbourhoods should be encouraged to take proactive action, in conjunction with local government efforts. The RDNO should apply FireSmart principles to district-owned buildings, as well as supporting residents to follow suit. Home ignitibility in the WUI is more closely tied to the immediate areas surrounding homes and buildings than it is to large-scale wildfire management and fuel modification treatments (Cohen, 2000). Cooperation between private homeowners and local governments is key for significantly reducing the overall WUI wildfire threat in a community.

5.2.2 Key Aspects of FireSmart for Local Governments

This sub-section provides a summary of FireSmart activities that may be used to measure current implementation levels, and includes recommendations for suggested activities. Community members and stakeholders could be provided several options to mitigate wildfire risk to their homes, buildings, and properties.

Successful FireSmart communities depend on interested and proactive individuals who understand the risk of living in a wildfire prone environment. Local governments are unable to force residents to both increase their understanding of FireSmart, and apply FireSmart principles their private properties. However, local governments can promote FireSmart to residents through public education and awareness campaigns, which aim to encourage a motivated community of people who are committed to reduce the ignitability of their homes.

Local governments are faced with the persistent challenge of how to help home and property owners achieve FireSmart if the owners are unable, or unwilling to take action. Provincially funded mitigation programs have recently offered a small FireSmart rebate program that benefits private landowners. Local governments need to apply for and administer the funding. This is an improvement from previous years, where no funding was available for applying FireSmart principles to private property. Regardless, local governments should continually brainstorm ways of gaining community interest, motivation, and participation in FireSmart activities. Even when most homes and properties adhere to FireSmart principles, if unmitigated private properties are interspersed among them, the overall threat to mitigated property remains, due to structure-to-structure ignition and propagation potential.

Table 23 provides a summary of FireSmart practices and activities that could be adopted by the RDNO and their communities. These suggestions have been successful for local governments in the past.

Table 23: FireSmart practices and activities

FireSmart Theme	Suggested Activities
Communication, Education & Partnerships	• Host a FireSmart day (aka Wildfire Community Preparedness Day) • Use local government and First Nation newsletters, and social media • Undertake FireSmart Local Representative or Community Champion Training • Continue to pursue CRI funding for FireSmart projects • Form community-wide FireSmart committees in each Electoral Area • Encourage homeowners and/or neighborhoods to undertake FireSmart site assessments and area assessments • Utilize BC FireSmart resources for community education
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 replacing legacy high-flammability plants • Facilitate treatment debris disposal for landowners
Planning & Development	• Strengthen policies and practices for FireSmart construction and maintenance of public buildings • Maintain the Wildfire Hazard Development Permit Area to require specific FireSmart exterior finishing, and landscaping in Area F • Develop a Wildfire Hazard Development Permit Area for Areas D & E

5.2.3 Priority Areas within the Area of Interest for FireSmart

This sub-section used the gathered information from the local wildfire threat assessments (see Section 4) to best understand the priority areas for FireSmart planning and activities. This was

primarily based on wildfire risk adjacent to established neighbourhoods, although FireSmart principles may also be applied to isolated critical infrastructure.

There is currently one FireSmart neighbourhood within the AOI that has been recognized by FireSmart Canada: Splatsin First Nation has been recognized since 2017, because they are taking the necessary steps to build true wildfire resiliency. Table 24 provides a summary of completed and recommended FireSmart projects within the AOI. Recommended areas have been given generalised Area ID names, and may be further stratified into smaller neighbourhoods, if needed. The summary has been developed using information obtained during the CWPP process, including field and office work.

Table 24: Summary of completed and recommended FireSmart projects

Area ID	FireSmart project complete? Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities Suggested timeline: 6 years (2-3 projects per year)
Splatsin First Nation	Y (2017)	Y	Completed FireSmart projects: • Support annual recertification of FireSmart recognition • Support an annual neighbourhood FireSmart day • Support the continuation of neighbourhood interest and participation
Mabel Lake Community Hall – 111 Shuswap Falls Rd (Area D)	N	N	Land ownership attributed to the RDNO: • Seek CRI funding for a community asset FireSmart project (i.e., Critical Infrastructure) • Support completion of a FireSmart Home Ignition Zone Assessment Score Card • Undertake mitigation work and utilize the opportunity to educate the local community throughout the project
Echo Lake East 1850-1880 Creighton Valley Road (Area D)	N	N	Support a Community Recognition project for Areas D & E by: • Seeking CRI funding • Supporting the formation of two neighbourhood FireSmart committees - one for each Area (i.e., FireSmart Boards) • Supporting the development of a Neighbourhood Assessment Report Provide annual support to the FireSmart boards to hold a neighbourhood FireSmart event each year.
Harris Creek Rd (Area D)	N	N	
Lewis Rd (Area D)	N	N	
Shuswap River Rd (Area D)	N	N	
Mabel Lake – Lumby-Mabel Lake Rd (Area D)	N	N	

Area ID	FireSmart project complete? Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities Suggested timeline: 6 years (2-3 projects per year)
Cherryville – Specht Rd, North Fork Rd, Cherryville Estates (Area E)	N	N	
Mara, East Poirier Rd, Johnson Rd (Area F)	N	N	Support a Community Recognition project for Area F by: • Seeking CRI funding • Supporting the formation of a neighbourhood FireSmart committee (i.e., FireSmart Board) • Supporting the development of a Neighbourhood Assessment Report Provide annual support to the FireSmart board to hold a neighbourhood FireSmart event each year.
Gunther Ellison Rd / Twin Lakes Rd (Area F)	N	N	
Glennary Rd / Crossman Rd (Area F)	N	N	
Naylor Rd (Area F)	N	N	
Grandview Bench Rd / Black Rd (Area F)	N	N	
Edgar Rd (Area F)	N	N	

The Mabel Lake Community Hall in Tolley Park is located at 111 Shuswap Falls Road, Lumby, and can be rented for events with up to 166 people. The area was assessed as having a moderate wildfire behaviour threat score, with no fuel treatment recommended. In addition, the Hall and yard was examined due to its many FireSmart features. Figure 27 shows that the Hall is kept tidy, surrounded by a non-combustible zone; however, embers and sparks could collect underneath the open deck, so recommend enclosing the deck with fire-resistant materials to reduce the likelihood of an ignition. The Hall has been included in Table 24, because only a few actions would be required to bring the structure and grounds up to FireSmart standards. Once the FireSmart project is complete, the public building would provide the community with another excellent example of a building resilient to wildfire ignition.

Date & Time: Tue. May 18, 2021, 12:08:14 PDT
Position: 11 N 370501 5573524 (±5.0m)
Altitude: 422m (±6.0m)
Datum: WGS-84
Azimuth/Bearing: 211° S31W 3751mils True (±20°)
Elevation Grade: +009%
Horizon Grade: +002%
Zoom: 1.0X

Figure 27: Mabel Lake Community Hall in Tolley Park FireSmart example - could enclose the underside of the deck with fire-resistant material to reduce the risk of embers and sparks collecting underneath and igniting the hall

5.3 Community Communication and Education

The intent of this sub-section is to concisely describe key steps for building engagement and support within the CWPP community. This includes education on fire prevention practices, outreach, and community programs.

The CWPP will only be successful if the community is engaged, informed, and supportive of the process and recommendations. Implementing specific activities identified within this CWPP is dependent on educating the community about the reasons for, and benefits of, certain mitigation activities.

The following community engagement strategies would benefit RDNO and the CWPP residents in furthering WUI fire awareness and education, many of which have previously been identified in the 2018 CWPP update (Davies Wildfire Management Inc., January 2019):

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

- o 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;
- Continue to host Wildfire or FireSmart Public Education Workshops, or Information Sessions throughout the RDNO prior to and during the fire season
- Develop a communication strategy regarding wildfire risk and priority mitigation measures that are being undertaken within and by the community

5.4 Other Prevention Measures

Fire prevention may be achieved through communication and education initiatives, as well as through developing and implementing policies and regulations, including operational guidelines and restrictions. Fire prevention may be addressed at the community level through various avenues. Examples of public fire prevention measures include danger class rating signs within fire protection zones, public communication, industrial work restrictions, and fire bans.

5.5 Summary of Recommendations

This sub-section provides a summary of the recommendations described in section 5 for risk management and mitigation factors.

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 1 – Risk Management and Mitigation Factors	Conduct fuel hazard mitigation on municipal land. Priority: High	Apply for funding to prescribe and treat the 5.7 ha of municipal ownership class land summarized in Table 22 surrounding Cherryville Elementary School and Hanson Park.	RDNO, with UBCM CRI funding support This is recommendation 1 of 2 for the Cherryville Elementary School FTU.
No. 2 – Risk Management and Mitigation Factors	Educate Cherryville residents and visitors about fuel hazard mitigation and FireSmart Priority: Moderate - High	In conjunction with recommendation No. 1, or after fuel treatment is completed, design educational signs, and erect next to the roadside picnic tables across from the Cherryville Elementary School to further enhance the wildfire mitigation work, and encourage residents to FireSmart their own properties.	RDNO, with UBCM CRI funding support, if possible This is recommendation 2 of 2 for the Cherryville Elementary School FTU.

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 3 – Risk Management and Mitigation Factors	Support fuel hazard mitigation on crown lands. Priority: High	Support FLNRORD to develop prescriptions to undertake wildfire risk reduction treatments on 327.0 ha + 3.6 ha = 330.6 ha of crown land summarized in Table 22. Treatments include interface and landscape fuel breaks.	FLNRORD, with funding from the Crown Land Wildfire Risk Reduction (CLWRR) program RDNO to engage and partner with FLNRORD for completing the work
No. 4 – Risk Management and Mitigation Factors	Support use of prescribed fire in the region. Priority: Moderate	Support FLNRORD, First Nations, and any agencies that are using prescribed fire to manage fuel treatment units, increased fuel loads, and enhance ecological areas. Amplify public engagement that supports prescribed fire use. The use of prescribed fire often results in less smoke output compared with similar areas burning from an unplanned wildfire.	RDNO, and regional partners This recommendation is in alignment with the 2018 CWPP update and should be completed for the RDNO entirety.
No. 5 – Risk Management and Mitigation Factors	Establish a partnership between RDNO and MoTI to address wildland fuel hazard concerns along Provincial highways and on MoTI owned rights of way. Priority: Moderate	Develop an agreement to facilitate ongoing and shared interest in wildland fuel management and roadside vegetation control, including identifying, monitoring, and mitigating roadside wildland fuel hazards. Establish best practices for controlling roadside vegetation in the RDNO, that aim to limit hazardous fuel during the fire season.	RDNO and MoTI, with support from CLWRR and/or UBCM CRI funding
No. 6 – Risk Management and Mitigation Factors	Maintain the Wildfire Hazard Development Permit Area for Area F. Priority: High	Maintain the Wildfire Hazard Development Permit Area (DPA) for the RDNO Area F Official Community Plan (OCP). When the OCP is amended or updated, ensure that requirements and guidelines complement current FireSmart principles. Consider requiring specific FireSmart exterior finishing, and landscaping for new developments within the DPA.	RDNO This recommendation is to ensure that wildfire hazard mitigation planning is current in bylaws and new developments.

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 7 – Risk Management and Mitigation Factors	Develop a Wildfire Hazard Development Permit Area for Area D & E. Priority: Moderate - High	Develop a Wildfire Hazard DPA for the RDNO Area D & E OCP. When the OCP is amended or updated, establish the Wildfire Hazard DPA in alignment with the Area F OCP. Ensure that requirements and guidelines complement current FireSmart principles. Consider requiring specific FireSmart exterior finishing, and landscaping for new developments within the DPA.	RDNO This recommendation is to ensure that wildfire hazard mitigation planning is current in bylaws and new developments.
No. 8 – Risk Management and Mitigation Factors	Conduct a FireSmart Assessment and mitigation work for Mabel Lake Community Hall at 111 Shuswap Falls Rd. Priority: High	Pursue funding for a community asset FireSmart project for a municipal-owned building and property. Support completion of the FireSmart Assessment and mitigation work. Educate the community throughout the project and provide FireSmart information to the public upon completion. Maintain the building and grounds to FireSmart standards.	RDNO, with UBCM CRI funding support This recommendation is for the RDNO to create a FireSmart demonstration area for the rural Lumby community.
No. 9 – Risk Management and Mitigation Factors	Conduct FireSmart Community Recognition Projects Priority: High	Support new FireSmart Community Recognition projects for neighbourhoods in Areas D, E, & F. A list of recommended neighbourhoods is listed in Table 24. Over a 6-year period, complete 2-3 community recognition projects per year. Utilize funding from the FireSmart Rebate Program of up to $500 per property to encourage residents to participate. Provide annual support to neighbourhoods after they achieve FireSmart Canada recognition.	RDNO, with UBCM CRI funding support

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 10 – Risk Management and Mitigation Factors	Share the CWPP and related deliverables with the public, First Nations, adjacent local governments, industry, and relevant NGOs. Priority: Moderate	Establish a wildfire safety and hazard reduction page on the RDNO website to share the CWPP, highlight the FireSmart program, and recommend simple actions for homeowners to reduce ignitability of their homes. Engage in public education information sessions throughout the community to present the CWPP, and share wildfire management and FireSmart information.	RDNO This recommendation is in alignment with the 2018 CWPP update and should be completed for the RDNO entirety.
No. 11 – Risk Management and Mitigation Factors	Develop a communication strategy for wildfire risk and mitigation measures. Priority: Moderate	Prepare a written strategy that outlines how wildfire risks and mitigation measures will be communicated with the community. Include specific strategies to improve wildfire education. Outline how and when information about what local mitigation measures are being undertaken within and by the community will be communicated. Continue to host Wildfire or FireSmart Public Education Workshops, or Information Sessions throughout the RDNO prior to and during the fire season. Promote WUI wildfire threat reduction as a mutually beneficial strategy between local governments and private property owners, where all parties take responsibility for reducing wildfire hazard, and increasing wildfire resiliency for the community.	RDNO This recommendation is specific to community communication and education.

SECTION 6: Wildfire Response Resources

This section provides a high-level overview of resources available to the RDNO in the event of a wildfire. Interface fires are complex incidents that typically involve both wildland and structural fires. During periods when numerous large fires are burning in BC, and threatening multiple

communities simultaneously, resource requests may exceed the resources available. The Province of BC (2016) deploys available resources according to the Provincial Coordination Plan for Wildland Urban Interface Fires (last revised July 2016).

The BCWS is responsible for responding to wildfires outside a local fire protection jurisdiction; however, if resources are available, the BCWS will support fire departments within their response jurisdiction, upon request. More information regarding remuneration, especially for fire departments responding to wildfires outside their jurisdiction at BCWS request, is available from the Inter-Agency Operational Procedures and Reimbursement Rates Memorandum of Agreement (Office of the Fire Commissioner, Fire Chiefs Association of BC, & BCWS, 2020).

6.1 Local Government Firefighting Resources

This sub-section is intended to identify firefighting resources available within the AOI, including fire departments and equipment, water availability for wildfire suppression, access and evacuation, and training.

Within the AOI, the following fire protection areas are established:

- Lumby Fire Hall (Rural Lumby / Area D)
- Enderby Fire Hall (Enderby FP – Splatsin / Shuswap River / Area F)
- Ranchero-Deep Creek Volunteer Fire Department (Twin Lks/Grandview Bench / Area F) – provides fire protection under contract with the RDNO

6.1.1 Fire Departments and Equipment

Lumby and District Volunteer Fire Department apparatus include the following:

- Rescue 31 – 2012 Freightliner M2 / Hub
- Wildland 32 – 2020 Ford F-550 / ITB
- Tender 36 – 2015 Freightliner M2 106 / Rosenbauer
- Tender 37 – 2004 Freightliner M2 106 / American Lafrance / Hub
- Engine 38 – 2019 Spartan Metro Star MFD 4x4 / Fort Garry
- Ladder 39 – 2006 American Lafrance Metropolitan / Hub 65' Boom

Enderby and District Volunteer Fire Department apparatus include the following:

- Engine 10 – 2008 Spartan Gladiator / Hub
- Engine 11 – 1977 International CO1810B / Hub
- Engine 12 – 1992 International S / Hub
- Engine 14 – 2014 Freightliner M2 106 4x4 / Hub pumper/tanker
- Tender 15 – 2007 International 4400 / Hub
- Tender 16 – 1986 International S1954 / Daltech
- Rescue 17 – 1999 International 4700 / Superior

Ranchero-Deep Creek Volunteer Fire Department apparatus include the following:

- Engine 374 – 2011 Freightliner M2 106 / Hub
- Tender 373 – 2007 Freightliner M2 106 / American LaFrance
- Tender – 2015 Freightliner M2 106 4x4 / Hub

Although Area E does not have a fire protection area or fire department, Cherryville have developed a fire control guide and list of volunteers, including two fire wardens (Cherry Ridge

Management Committee, 2021). The following volunteered resources have been identified within the community, which may be available to help supress wildfire, upon request:

- Mobile water tank with pump x3
- 4,000 gallon water truck
- 3,000 gallon water truck
- 2,500 gallon water truck
- 1,200 gallon water truck
- 1,000 gallon water truck
- Heavy equipment (x4 volunteers)
- Bobcat
- Skidder with water tank x3
- Truck with water tank
- Water trailer with pump x2
- 300 gallon water tank
- Buncher, grapple skidder
- Water pump, power saws, hand tools x2
- Heavy equipment and water tanks
- Water pump, hose, etc.
- 12 x 100' lengths of 11/2" hose, 2 nozzles, pump, 6 Pulaskis, 6 shovels

6.1.2 Water Availability for Wildfire Suppression

The CWPP AOI covers rural areas outside of municipalities, where fire hydrants are generally not available. In some cases, private properties may have their own fire hydrants, as per BC Building Code standards. Throughout the AOI, water availability for firefighting would come from natural sources, human-made containment structures (i.e., pools, ponds, etc.), and water tenders servicing the fire protection areas.

As recommended in the 2018 CWPP update (Davies Wildfire Management Inc., January 2019), the RDNO should consider developing a Pre-Attack Plan Worksheet Map outlining potential water source locations. Include other relevant fire fighting details that would be useful for non-local fire departments or emergency crews who may be assisting with large-scale wildfire events.

6.1.3 Access and Evacuation

Other than the independent evacuation plan developed by Splastin First Nation for the Indian Reserve (Splatsin, 2021), there are no formalized evacuation routes within the AOI, as mentioned in sub-section 2.2.6. Evacuation plans have been developed for other parts of the RDNO, but none are in place for this 2020 CWPP. A comprehensive evacuation route plan is being developed for the RDNO, which should also consider key areas of rural Lumby, Shuswap falls, Mabel Lake, Cherryville, Sugar Lake, and Grindrod.

In terms of the recommended Pre-Attack Plan (sub-section 6.1.3), areas with single or poor access should be highlighted. This could include developments with only one access point, as well as access locations for natural water bodies, whether they are gated, and vehicle type needed to access the water source. Access routes are often used as evacuation routes.

6.1.4. Training

There are numerous wildland firefighting courses listed in the BCWS training catalogue. However, non-BCWS firefighters have limited opportunities to attend these valuable training sessions because the courses tend to be reserved for BCWS employees. Firefighting personnel responding to wildfire events within the AOI are often faced with WUI situations where additional training would be beneficial. In addition to maintaining the current level of structural protection training and the S-100 Basic Fire Suppression and Safety course, the following courses are recommended:

- Intermediate Wildland Fire Behaviour
- Wildfire Scene Preservation for First Responders
- Wildfire Origin and Cause Investigation
- Ignition operations and prescribed burn training
- Air operations and tactics training

Training could be arranged in partnership with the BCWS and/or adjacent Regional Districts / Municipalities, and include periodic mock or tabletop exercises.

6.2 Structure Protection

The ability to undertake structure assessments, plan, and deploy structure protection sprinklers usually is not possible during a developing WUI fire. As a recently ignited wildfire spreads, resources are often dedicated to life, safety, and fire control, with no wiggle room to dedicate structure protection units (SPUs) and crews to secondary values. SPU crews and specialists are most often deployed to longer duration wildfires, or those that could become longer duration, extensive areas require SPU capability. In these cases, Type 1 SPU trailers are often deployed.

Homeowners should not rely on SPU capabilities to protect their home during a wildfire. Instead, residents should be focused on being prepared and proactive, taking active and concerted efforts to assess and mitigate hazards affecting the ignitability of their homes before a WUI fire disaster unfolds. It would not be possible to dedicate sprinklers and firefighters to protect all homes in the RDNO AOI from wildfire. Homeowners need to familiarize themselves with FireSmart, and take action themselves ahead of time (BCWS, 2019).

Scenarios exist where a local SPU could be deployed in a timely manner, and offer a tactical advantage to the local fire service. Some fire departments in BC have procured their own SPUs to complement their suppression capabilities. In many cases, it has proven to be a valuable tool for local suppression needs. Additionally, it can also prove to be a significant source of income during the fire season when provided to the BCWS. Such income can help subsidize the fire department and reduce the budgetary needs or burden on the local government.

The RDNO should engage in discussions with rural Fire Departments servicing the AOI to determine their interest in SPU acquisition. Supporting such interest needs to fit into the RDNO budget.

6.3 Summary of Recommendations

This sub-section provides a summary of the recommendations described in section 6 for wildfire response.

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 12 - Wildfire Response	Develop a pre-attack wildfire response plan to guide wildfire suppression strategies and tactics. Priority: High	Also known as a pre-suppression plan, develop a detailed map that identifies staging areas, water sources, trail heads, drop points, access, other potential incident facilities and landmarks, etc.. Consider identifying suitable heli pads. Consider developing the response plan jointly with BCWS and adjacent response partners to facilitate firefighting assistance.	RDNO and BCWS This recommendation is in alignment with the 2018 CWPP update and should be completed for the RDNO entirety.
No. 13 - Wildfire Response	Increase wildfire training for volunteer firefighters. Priority: Moderate - High	Recommend working with the BCWS to provide the following courses to local volunteer firefighters: • Intermediate Wildland Fire Behaviour • Wildfire Scene Preservation for First Responders • Wildfire Origin and Cause Investigation • Ignition operations and prescribed burn training • Air operations and tactics training	RDNO, with support from BCWS

Recommendation No.	Objective/Priority	Recommendation / Next Steps	Responsibility/Funding Source / Comments
No. 14 - Wildfire Response	Pursue a joint wildland tabletop exercise with response partners. Priority: Moderate	In conjunction with the Fire Departments of B.X./Swan Lake, Lumby & District, Silver Star, Armstrong / Spallumcheen, Coldstream, Enderby, Lavington, Vernon Fire Rescue, Ranchero-Deep Creek, BCWS, and other interested response partners, hold a joint wildfire tabletop exercise to practice interagency coordination and cooperation. Recommended participants include command and general staff positions.	RDNO, BCWS, and municipal / regional partners with UBCM CRI funding support
No. 15 - Wildfire Response	Acquire Type 2 Structure Protection Units for Lumby and Enderby. Priority: Moderate	Consider acquiring Type 2 Structure Protection Units (SPUs) for Lumby and Enderby to complement suppression capabilities. Offers a tactical advantage to local fire departments. During the fire season, can be provided to BCWS for a fee to help supplement fire department budgets.	RDNO This recommendation is in alignment with the 2018 CWPP update and could be completed for the RDNO entirety.

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Appendix 1: List of potentially occurring Red and Blue listed species and plant communities within the AOI

Common name	Scientific name	BC list status
Vertebrate animals		
American White Pelican	*Pelecanus erythrorhynchos*	Red
Barn Owl	*Tyto alba*	Red
Bay-breasted Warbler	*Setophaga castanea*	Red
Black-crowned Night-heron	*Nycticorax nycticorax*	Red
Blotched Tiger Salamander	*Ambystoma mavortium*	Red
Burrowing Owl	*Athene cunicularia*	Red
Caribou (Southern Mountain Population)	*Rangifer tarandus* pop. 1	Red
Clark's Grebe	*Aechmophorus clarkii*	Red
Columbia Dune Moth	*Copablepharon absidum*	Red
Desert Nightsnake	*Hypsiglena chlorophaea*	Red
Forster's Tern	*Sterna forsteri*	Red
Grasshopper Sparrow	*Ammodramus savannarum*	Red
Hudsonian Godwit	*Limosa haemastica*	Red
Least Chipmunk, *selkirki* subspecies	*Neotamias minimus selkirki*	Red
Northern Leopard Frog	*Lithobates pipiens*	Red
Northern Pocket Gopher, segregatus subspecies	*Thomomys talpoides segregatus*	Red
Prairie Falcon	*Falco mexicanus*	Red
Preble's Shrew	*Sorex preblei*	Red
Peregrine Falcon, *anatum* subspecies	*Falco peregrinus anatum*	Red
Red-tailed Chipmunk, *ruficaudus* subspecies	*Neotamias ruficaudus ruficaudus*	Red
Sage Thrasher	*Oreoscoptes montanus*	Red
Spotted Owl	*Strix occidentalis*	Red
Swainson's Hawk	*Buteo swainsoni*	Red
Umatilla Dace	*Rhinichthys umatilla*	Red
Western Grebe	*Aechmophorus occidentalis*	Red
White-headed Woodpecker	*Dryobates albolarvatus*	Red
White-tailed Jackrabbit	*Lepus townsendii*	Red
Yellow-breasted Chat	*Icteria virens*	Red
American Avocet	*Recurvirostra americana*	Blue
American Bittern	*Botaurus lentiginosus*	Blue
American Golden-Plover	*Pluvialis dominica*	Blue
Band-tailed Pigeon	*Patagioenas fasciata*	Blue
Barn Swallow	*Hirundo rustica*	Blue
Bighorn Sheep	*Ovis canadensis*	Blue
Black Swift	*Cypseloides niger*	Blue
Black-throated Green Warbler	*Setophaga virens*	Blue
Brant	*Branta bernicla*	Blue
Brewer's Sparrow, *breweri* subspecies	*Spizella breweri breweri*	Blue
Broad-winged Hawk	*Buteo platypterus*	Blue
Bull Trout	*Salvelinus confluentus*	Blue
California Gull	*Larus californicus*	Blue
Canyon Wren	*Catherpes mexicanus*	Blue
Caspian Tern	*Hydroprogne caspia*	Blue
Coeur d'Alene Oregonian	*Cryptomastix mullani*	Blue
Columbia Plateau Pocket Mouse	*Perognathus parvus*	Blue
Columbia Sculpin	*Cottus hubbsi*	Blue

Common name	Scientific name	BC list status
Cutthroat Trout, *clarkii* subspecies	*Oncorhynchus clarkii clarkii*	Blue
Cutthroat Trout, *lewisi* subspecies	*Oncorhynchus clarkii lewisi*	Blue
Double-crested Cormorant	*Phalacrocorax auritus*	Blue
Eared Grebe	*Podiceps nigricollis*	Blue
Flammulated Owl	*Psiloscops flammeolus*	Blue
Fringed Myotis	*Myotis thysanodes*	Blue
Gopher Snake, *deserticola* subspecies	*Pituophis catenifer deserticola*	Blue
Gray Flycatcher	*Empidonax wrightii*	Blue
Green Heron	*Butorides virescens*	Blue
Grizzly Bear	*Ursus arctos*	Blue
Gyrfalcon	*Falco rusticolus*	Blue
Horned Lark, *merrilli* subspecies	*Eremophila alpestris merrilli*	Blue
Lark Sparrow	*Chondestes grammacus*	Blue
Least Chipmunk, *oreocetes* subspecies	*Neotamias minimus oreocetes*	Blue
Lewis's Woodpecker	*Melanerpes lewis*	Blue
Long-billed Curlew	*Numenius americanus*	Blue
Mountain Goat	*Oreamnos americanus*	Blue
North American Racer	*Coluber constrictor*	Blue
Northern Bog Lemming, *artemisiae* subspecies	*Synaptomys borealis artemisiae*	Blue
Northern Goshawk, Atricapillus Subspecies	*Accipiter gentilis atricapillus*	Blue
Northern Myotis	*Myotis septentrionalis*	Blue
Nuttall's Cottontail	*Sylvilagus nuttallii*	Blue
Olive-sided Flycatcher	*Contopus cooperi*	Blue
Purple Martin	*Progne subis*	Blue
Red-necked Phalarope	*Phalaropus lobatus*	Blue
Red-tailed Chipmunk, *simulans* subspecies	*Neotamias ruficaudus simulans*	Blue
Rocky Mountain Tailed Frog	*Ascaphus montanus*	Blue
Rough-legged Hawk	*Buteo lagopus*	Blue
Rusty Blackbird	*Euphagus carolinus*	Blue
Short-billed Dowitcher	*Limnodromus griseus*	Blue
Shorthead Sculpin	*Cottus confusus*	Blue
Smith's Longspur	*Calcarius pictus*	Blue
Southern Red-backed Vole, *galei* subspecies	*Myodes gapperi galei*	Blue
Speckled Dace	*Rhinichthys osculus*	Blue
Spotted Bat	*Euderma maculatum*	Blue
Surf Scoter	*Melanitta perspicillata*	Blue
Western Harvest Mouse	*Reithrodontomys megalotis*	Blue
Western Rattlesnake	*Crotalus oreganus*	Blue
Western Small-footed Myotis	*Myotis ciliolabrum*	Blue
White-throated Swift	*Aeronautes saxatalis*	Blue
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Blue
Wolverine, *luscus* subspecies	*Gulo gulo luscus*	Blue
Yellow-billed Cuckoo	*Coccyzus americanus*	Blue
Invertebrate animals		
Ashy Pebblesnail	*Fluminicola fuscus*	Red
Behr's Hairstreak	*Satyrium behrii*	Red
Dark Saltflat Tiger Beetle	*Cicindela parowana*	Red
Dione Copper	*Lycaena dione*	Red
Glossy Valvata	*Valvata humeralis*	Red
Half-moon Hairstreak	*Satyrium semiluna*	Red
Hoffman's Checkerspot	*Chlosyne hoffmanni*	Red

Common name	Scientific name	BC list status
Monarch	*Danaus plexippus*	Red
Mormon Fritillary, *erinna* subspecies	*Speyeria mormonia erinna*	Red
Mormon Metalmark	*Apodemia mormo*	Red
Okanagan Hammertail	*Efferia okanagana*	Red
Old World Swallowtail, dodi subspecies	*Papilio machaon dodi*	Red
Olive Clubtail	*Stylurus olivaceus*	Red
Rocky Mountain Ridged Mussel	*Gonidea angulata*	Red
Rotund Physa	*Physella columbiana*	Red
Sandhill Skipper	*Polites sabuleti*	Red
Shortface Lanx	*Fisherola nuttalli*	Red
Tapered Vertigo	*Vertigo elatior*	Red
Viceroy	*Limenitis archippus*	Red
Abbreviate Pondsnail	*Stagnicola apicina*	Blue
Albert's Fritillary	*Boloria alberta*	Blue
Alkali Bluet	*Enallagma clausum*	Blue
Aphrodite Fritillary, *manitoba* subspecies	*Speyeria aphrodite manitoba*	Blue
Attenuate Fossaria	*Galba truncatula*	Blue
Banded Tigersnail	*Anguispira kochi*	Blue
Bronze Copper	*Lycaena hyllus*	Blue
California Hairstreak	*Satyrium californica*	Blue
Checkered Skipper	*Pyrgus communis*	Blue
Clodius Parnassian, *pseudogallatinus* supspecies	*Parnassius clodius pseudogallatinus*	Blue
Common Sootywing	*Pholisora catullus*	Blue
Dun Skipper	*Euphyes vestris*	Blue
Dusky Fossaria	*Galba dalli*	Blue
Eastern Tailed Blue	*Cupido comyntas*	Blue
Emma's Dancer	*Argia emma*	Blue
Forcipate Emerald	*Somatochlora forcipata*	Blue
Gillette's Checkerspot	*Euphydryas gillettii*	Blue
Hairy-necked Tiger Beetle	*Cicindela hirticollis*	Blue
Herrington Fingernailclam	*Sphaerium occidentale*	Blue
Immaculate Green Hairstreak	*Callophrys affinis*	Blue
Jutta Arctic, *chermocki* subspecies	*Oeneis jutta chermocki*	Blue
Lance-tipped Darner	*Aeshna constricta*	Blue
Lilac-bordered Copper	*Lycaena nivalis*	Blue
Long Fingernailclam	*Musculium transversum*	Blue
Magnum Mantleslug	*Magnipelta mycophaga*	Blue
Mead's Sulphur	*Colias meadii*	Blue
Nevada Skipper	*Hesperia nevada*	Blue
Northern Tightcoil	*Pristiloma arcticum*	Blue
Pale Jumping-slug	*Hemphillia camelus*	Blue
Prairie Fossaria	*Galba bulimoides*	Blue
Pronghorn Clubtail	*Phanogomphus graslinellus*	Blue
Pygmy Slug	*Kootenaia burkei*	Blue
River Jewelwing	*Calopteryx aequabilis*	Blue
River Peaclam	*Pisidium fallax*	Blue
Rocky Mountain Physa	*Physella propinqua*	Blue
Sharp-tailed Grouse, *columbianus* subspecies	*Tympanuchus phasianellus columbianus*	Blue
Silver-spotted Skipper	*Epargyreus clarus*	Blue
Silver-spotted Skipper, *clarus* subspecies	*Epargyreus clarus clarus*	Blue
Sinuous Snaketail	*Ophiogomphus occidentis*	Blue

Common name	Scientific name	BC list status
Sonora Skipper	*Polites sonora*	Blue
Striated Fingernailclam	*Sphaerium striatinum*	Blue
Subalpine Mountainsnail	*Oreohelix subrudis*	Blue
Sunset Physa	*Physella virginea*	Blue
Swamp Fingernailclam	*Musculium partumeium*	Blue
Tawny-edged Skipper, *themistocles* subspecies	*Polites themistocles themistocles*	Blue
Twelve-spotted Skimmer	*Libellula pulchella*	Blue
Umbilicate Sprite	*Promenetus umbilicatellus*	Blue
Variegated Fritillary	*Euptoieta claudia*	Blue
Vivid Dancer	*Argia vivida*	Blue
Wandering Tattler	*Tringa incana*	Blue
Western Pondhawk	*Erythemis collocata*	Blue
Western River Cruiser	*Macromia magnifica*	Blue
Widelip Pondsnail	*Stagnicola traski*	Blue
Wrinkled Marshsnail	*Stagnicola caperata*	Blue
Vascular plants		
Alkali-marsh butterweed	*Senecio hydrophilus*	Red
California Jacob's ladder	*Polemonium californicum*	Red
Columbia quillwort	*Isoetes minima*	Red
Dwarf hesperochiron	*Hesperochiron pumilus*	Red
Foxtail muhly	*Muhlenbergia andina*	Red
Idaho blue-eyed grass	*Sisyrinchium idahoense var. occidentale*	Red
Purple spike-rush	*Eleocharis atropurpurea*	Red
Rocky Mountain clubrush	*Schoenoplectiella saximontana*	Red
Satinflower	*Olsynium douglasii var. inflatum*	Red
Showy phlox	*Phlox speciosa* ssp. *occidentalis*	Red
White western groundsel	*Senecio integerrimus var. ochroleucus*	Red
American sweet-flag	*Acorus americanus*	Blue
Close-flowered knotweed	*Polygonum polygaloides* ssp. *confertiflorum*	Blue
Cut-leaved water-parsnip	*Berula incisa*	Blue
Dark-green hawthorn	*Crataegus atrovirens*	Blue
Hairstem groundsmoke	*Gayophytum ramosissimum*	Blue
Hairy paintbrush	*Castilleja tenuis*	Blue
Hairy water-clover	*Marsilea vestita*	Blue
Heart-leaved springbeauty	*Claytonia cordifolia*	Blue
Lance-leaved figwort	*Scrophularia lanceolata*	Blue
Mexican mosquito fern	*Azolla mexicana*	Blue
Michigan moonwort	*Botrychium michiganense*	Blue
Mountain moonwort	*Botrychium montanum*	Blue
Near navarretia	*Navarretia propinqua*	Blue
Ochroleucous bladderwort	*Utricularia ochroleuca*	Blue
Okanagan hawthorn	*Crataegus okanaganensis* var. *okanaganensis*	Blue
Peach-leaf willow	*Salix amygdaloides*	Blue
Peduncled sedge	*Carex pedunculata*	Blue
purple meadowrue	*Thalictrum dasycarpum*	Blue
Rabbitbrush goldenweed	*Ericameria bloomeri*	Blue
Sheathed Slug	*Zacoleus idahoensis*	Blue
Slender arrow-grass	*Triglochin concinna var. debilis*	Blue
Slender gilia	*Lathrocasis tenerrima*	Blue

Common name	Scientific name	BC list status
Smooth goldenrod	*Solidago gigantea* var. *shinnersii*	Blue
Sulphur lupine	*Lupinus sulphureus*	Blue
Sweet-marsh butterweed	*Senecio hydrophiloides*	Blue
Varied-leaf phacelia	*Phacelia heterophylla* var. *virgata*	Blue
Wild licorice	*Glycyrrhiza lepidota*	Blue
Whitebark pine	*Pinus albicaulis*	Blue
Woolly blue violet	*Viola sororia*	Blue
Bryophytes		
Margined streamside moss	*Scouleria marginata*	Red
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	Blue
Banded cord-moss	*Entosthodon fascicularis*	Blue
Columbian carpet moss	*Bryoerythrophyllum columbianum*	Blue
Potentially Occurring Ecological Communities at Risk		
Antelope-brush / needle-and-thread grass	*Purshia tridentata / Hesperostipa comata*	Red
Baltic rush - common silverweed	*Juncus balticus - Potentilla anserina*	Red
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	Red
Big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	*Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata*	Red
Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	Red
Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood	*Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus sericea*	Red
Black cottonwood - Douglas fir / Douglas maple - common snowberry	*Populus trichocarpa - Pseudotsuga menziesii / Acer glabrum - Symphoricarpos albus*	Red
Douglas-fir / Douglas maple - red-osier dogwood	*Pseudotsuga menziesii / Acer glabrum - Cornus sericea*	Red
Douglas-fir - western larch / pinegrass	*Pseudotsuga menziesii - Larix occidentalis / Calamagrostis rubescens*	Red
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	Red
Long-awned three-square bulrush Alkali Marsh	*Schoenoplectus pungens* var. *longispicatus* Alkali Marsh	Red
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	Red
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	Red
Sitka willow - Pacific willow / skunk cabbage	*Salix sitchensis - Salix lasiandra var. lasiandra / Lysichiton americanus*	Red
Trembling aspen / common snowberry / mountain sweet-cicely	*Populus tremuloides / Symphoricarpos albus / Osmorhiza berteroi*	Red
Trembling aspen / common snowberry / Kentucky bluegrass	*Populus tremuloides / Symphoricarpos albus / Poa pratensis*	Red
Water birch / roses	*Betula occidentalis / Rosa* spp.	Red
Western redcedar - Douglas-fir / false Solomon's seal	*Thuja plicata - Pseudotsuga menziesii / Maianthemum racemosum*	Red
Alkali saltgrass - foxtail barley	*Distichlis spicata - Hordeum jubatum*	Blue

Common name	Scientific name	BC list status
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	Blue
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	Blue
Common cattail Marsh	Typha latifolia Marsh	Blue
common snowberry - prairie rose	Symphoricarpos albus - Rosa woodsii	Blue
Douglas-fir / common snowberry - birch-leaved spirea	*Pseudotsuga menziesii / Symphoricarpos albus - Spiraea betulifolia*	Blue
Douglas-fir / pinegrass - kinnikinnick	*Pseudotsuga menziesii / Calamagrostis rubescens - Arctostaphylos uva-ursi*	Blue
Douglas-fir / pinegrass - twinflower	*Pseudotsuga menziesii / Calamagrostis rubescens - Linnaea borealis*	Blue
Douglas-fir / shrubby penstemon - pinegrass	*Pseudotsuga menziesii / Penstemon fruticosus - Calamagrostis rubescens*	Blue
Douglas-fir - ponderosa pine / bluebunch wheatgrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata*	Blue
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	Blue
Douglas-fir - ponderosa pine / Idaho fescue	*Pseudotsuga menziesii - Pinus ponderosa / Festuca idahoensis*	Blue
Douglas-fir - ponderosa pine / pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Calamagrostis rubescens*	Blue
Douglas-fir - ponderosa pine / snowbrush	*Pseudotsuga menziesii - Pinus ponderosa / Ceanothus velutinus*	Blue
Hard-stemmed Bulrush Deep Marsh	*Schoenoplectus acutus* Deep Marsh	Blue
Hybrid white spruce / black gooseberry / wild sarsaparilla	*Picea engelmannii x glauca / Ribes lacustre / Aralia nudicaulis*	Blue
Lodgepole pine / Sitka alder / pinegrass	*Pinus contorta / Alnus alnobetula ssp. sinuata / Calamagrostis rubescens*	Blue
Narrow-leaved cotton-grass - shore sedge	*Eriophorum angustifolium - Carex limosa*	Blue
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	Blue
Subalpine fir / white-flowered rhododendron / sitka valerian	*Abies lasiocarpa / Rhododendron albiflorum / Valeriana sitchensis*	Blue
Subalpine fir / black huckleberry / bear-grass	*Abies lasiocarpa / Vaccinium membranaceum / Xerophyllum tenax*	Blue
Western redcedar / falsebox - Utah honeysuckle	*Thuja plicata / Paxistima myrsinites - Lonicera utahensis*	Blue
Western redcedar - western hemlock / common horsetail	*Thuja plicata - Tsuga heterophylla / Equisetum arvense*	Blue

Appendix 2: Local Wildfire Threat Process

The following subsections describe the local wildfire threat process for the CWPP AOI. This includes:

- A2.1 Fuel Type Attribute Assessment
- A2.2 Proximity of Fuel to the Community
- A2.3 Fire Spread Patterns
- A2.4 Topography
- A2.5 Local Wildfire Threat Classification
- A2.6 Local Wildfire Risk Classification
- A2.7 Summary of Local Wildfire Threat Classes

A2.1 Fuel Type Attribute Assessment

Accuracy of the local fire threat determination and fuel treatment design is directly linked to the accuracy of fuel type information. Incorrect fuel typing due to a significant disturbance, such as harvesting or major fire, to the degree that associated fire behaviour will drastically change, means the corresponding threat information will also be incorrect. BCWS annually produces a comprehensive fuel type layer for fire behaviour prediction using the Vegetation Resources Inventory (VRI) data. A description of fuel typing history, methods, and results is included in the BC Wildfire Fuel Typing and Fuel Type Layer Description (Perrakis, Eade, & Hicks, 2018).

There are limitations to the provincial scale approach when it comes to examining fine-scale variations in fuel structure on the landscape, and modeling the behaviour of individual fires. Examples of VRI attributes that could be readily verified in the field (by properly trained technicians) include tree species composition, tree height, tree density, tree age, and canopy cover. Stand attributes can be determined from individual tree attributes with proper sampling.

Various tables and calculators can be used for ground-truthing fuel structure characteristics[2]; although, predictions based on these studies would also benefit from field validation. These efforts often consist of significant research projects (e.g., destructive sampling and measurement of entire tree crowns) rather than simple field measurements. Knowing these characteristics can be used to inform the selection of the best fit Fire Behaviour Prediction (FBP) fuel type; however, it is not always obvious how to do so. For example, surface fuel loading or canopy bulk density are not described quantitatively for FBP fuel types in the technical system description[3].

The FBP system is a subsystem of the Canadian Forest Fire Danger Rating System. Key inputs come from FBP system fuel types, which are grouped into coniferous, deciduous, mixedwood, slash, and open. BC is so ecologically diverse, that fuel typing can be a challenge, which is why descriptions of forest floor, surface and ladder fuels, stand structure, and composition are included (Forestry Canada Fire Danger Group, 1992). Regardless, the limited number of FBP

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[2] Cruz et al. 2003a. Assessing canopy fuel stratum characteristics in crown fire prone fuel types of western North America. International Journal of Wildland Fire 12(1), 39-50. AND Alexander and Cruz. 2014. The general nature of crown fires. Fire Management Today 73(4):8-11.

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

fuel types available tends to be adequate for assessing fire-prone areas (Perrakis, Eade, & Hicks, 2018).

Ground-truthing FBP fuel types is more problematic. Assigning a FBP fuel type to a particular stand or vegetation polygon is a complex, somewhat subjective process, often described as a blend of 'art' and science. Evaluating FBP fuel types in the field requires specialized training and experience in a particular vegetation type, and is not readily done by most field technicians, unless performed by personnel who have locally relevant fire behaviour skills and experience.

The ecology of the AOI is primarily characterized by the IDF (51%) and ICH (46%) biogeoclimatic zones, with a very minor amount of ESSF (3%) at the highest elevations (Table 25). Subzones range from the very dry, hot IDF to the wet cold ESSF. The most prevalent BEC units are the IDFmw1 (46%) and ICHdw4 (28%), within the NDT4 and NDT3, respectively, which cover 74% of the AOI. Table 26 provides a more detailed breakdown of BEC units and NDT for each RDNO Area within the AOI.

Table 25: Breakdown of biogeoclimatic zones and NDT within the CWPP AOI

Biogeoclimatic (BEC) zone, subzone, variant		NDT	Area in AOI (ha)	% of AOI
BEC Unit	*Zone & Subzone Name*			
IDFmw1	Interior Douglas-fir Moist Warm	NDT4	45,053	46%
ICHdw4	Interior Cedar -- Hemlock Dry Warm	NDT3	27,590	28%
ICHmw5	Interior Cedar -- Hemlock Moist Warm	NDT2	10,264	11%
ICHmk1	Interior Cedar -- Hemlock Moist Cool	NDT3	3,761	4%
IDFdm1	Interior Douglas-fir Dry Mild	NDT4	3,226	3%
ICHmw2	Interior Cedar -- Hemlock Moist Warm	NDT2	3,064	3%
ESSFmh	Engelmann Spruce -- Subalpine Fir Moist Hot	NDT2	2,041	2%
IDFxh1	Interior Douglas-fir Very Dry Hot	NDT4	821	1%
ESSFwh1	Engelmann Spruce -- Subalpine Fir Wet Hot	NDT1	655	1%
ESSFwc4	Engelmann Spruce -- Subalpine Fir Wet Cold	NDT1	293	0.3%
ESSFdc1	Engelmann Spruce -- Subalpine Fir Dry Cold	NDT2	178	0.2%
		Total:	**96,946**	**100%**

Table 26: Breakdown of BEC zones and NDT by RDNO Electoral Area within the AOI

BEC Unit	NDT	Area D Area (ha)	Area D %	Area E Area (ha)	Area E %	Area F Area (ha)	Area F %
IDFmw1	NDT4	20,996	22%	11,316	12%	12,740	13%
ICHdw4	NDT3	12,393	13%	7,349	8%	7,847	8%
ICHmw5	NDT2	4,331	4%	4,758	5%	1,176	1%
ICHmk1	NDT3	3,033	3%	729	1%		
IDFdm1	NDT4	3,226	3%				
ICHmw2	NDT2	49	0.1%	2,440	3%	574	1%
ESSFmh	NDT2	268	0.3%	1,773	2%		
IDFxh1	NDT4	798	1%			22	0.02%
ESSFwh1	NDT1			446	0.5%	209	0.2%
ESSFwc4	NDT1			293	0.3%		
ESSFdc1	NDT2			178	0.2%		
Totals:		**45,094**	**47%**	**29,283**	**30%**	**22,569**	**23%**

The natural disturbance patterns of the IDFmw1, IDFdm1, and IDFxh1 are classified as NDT4, which historically had frequent stand maintaining fires (see section 4.1.1). Fire suppression practices, and current forest management have altered the natural disturbance patterns, resulting in denser fuels, and a change in structure that previously would have been maintained by periodic fire.

Most of the interface areas in this CWPP are categorized into the C-7 Ponderosa Pine/Douglas-fir, and M-1/2 Boreal Mixedwood fuel types, making up 25% and 22% of the AOI, respectively (Table 27). The C7 fuel type responds well to manual fuel treatments that target the small diameter understory conifers, and retain 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.

Table 27: Fuel type distribution in the RDNO AOI

FBP Fuel Type	Area (ha)	%
C-7 Ponderosa Pine/Douglas-fir	24,156	25%
M-1 Boreal Mixedwood - Leafless M-2 Boreal Mixedwood - Green	21,742	22%
Non-fuel (Urban, cultivation, etc.)	12,870	13%
C-5 Red and White Pine	12,104	12%
C-3 Mature Jack or Lodgepole Pine	8,012	8%
O-1a Matted/Cut Grass O-1b Standing Grass	6,353	7%
D-1 Leafless Aspen D-2 Green Aspen	5,948	6%
Water	3,190	3%
S-1 Jack or Lodgepole Pine Slash	1,333	1.4%
C-6 Conifer Plantation	943	1.0%
C-2 Boreal Spruce	217	0.2%
S-3 Coastal Cedar/Hemlock/Douglas-fir Slash	59	0.1%
S-2 White Spruce/Balsam Slash	19	0.02%
Total:	**96,946**	**100%**

At higher elevations, the ESSF and ICH zones and certain IDF subzones, C-3, C-5, and M-1/2 fuel types tend to fit best; however, there is room for fuel type improvements to better describe fuels in these zones by adding more fuel types to the FBP system. These areas are generally characterised by stand replacement fire regimes, where high-severity fires usually result in higher tree mortality. Wet belt ecosystems, as in the ICH, are particularly challenging to classify into FPB fuel types. The M-2 or C-5 fuel types tend to fit best, though these are far from ideal descriptions. The ICH can be subject to both low-intensity, and stand-replacing fires, which represents a mixed-severity fire regime.

Table 28 indicates fire behaviour potential of the FBP fuel types, as grouped into four categories based on their relevance to a wildfire threat assessment. As part of the CWPP planning process, the BCWS fuel type layer attribute information is verified using current data sources including imagery, new treatments, new developments, or updated disturbance data. If the current fuel type layer is considerably different from those in the field assessments, a Wildfire

Threat Assessment FBP Fuel Type Change Rationale is completed. No major or significant fuel type inaccuracies were noted during the local wildfire threat process for this CWPP.

Table 28: Fuel Type Categories and Crown Fire Spot 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

A2.2 Proximity of Fuel to the Community

Fuel buildup closest to the community usually represents the highest wildfire hazard. It is recommended to treat fuels to reduce the hazard to an acceptable level, starting from the value or structure and moving outward, which ensures mitigation continuity. Untreated areas between treatment areas and 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 values and/or structures at risk receive the highest rating followed by progressively lower ratings moving outwards.

The local wildfire threat assessment process subdivides the WUI into 3 areas – the first 100 meters (WUI 100), 101 to 500 meters (the WUI 500), and 501 to 2,000 meters (the WUI 2000). These zones provide guidance for classifying threat levels, and subsequent treatment priorities.

Table 29: Proximity to the Interface

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

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

Fuel treatment objectives usually aim to reduce the risk to values in the community, where the generally accepted practice is to begin treatments at the values and progress outwards. This strategy often straddles boundaries between private and public land, requiring a coordinated effort to gain meaningful results. Despite land ownership status, remaining sections of untreated fuel, reduce the overall effectiveness of adjacent fuel treatments. In some cases, fuel treatment efforts can become completely negated by adjacent untreated fuel.

A2.3 Fire Spread Patterns

Wind patterns can provide an indication of prevailing fire spread patterns in a localised site or area; however, at a landscape level, it is difficult to summarise wind speed and direction trends, let alone fire spread patterns. This CWPP AOI covers complex mountainous terrain, with highly variable wind patterns, and relatively few weather stations from which to analyse data. Trends of wind speed, wind direction, and fine fuel moisture (FFMC) provide information about initial spread rates, which can be depicted in an Initial Spread Index (ISI) rose, using ISI direction and magnitude. The BCWS has prepared ISI roses for many of its fire weather stations across the province, for inclusion in CWPPs. There are ISI roses for Curwen Creek, Fintry, Kettle 2, Mabel Lake 2, and Salmon Are (see Figure 28 through Figure 32). The information presented in the ISI Roses is useful for the immediate area, but caution should be used if attempting to interpret and apply the information to other areas. Mabel Lake 2 is the only weather station within the CWPP AOI which could be analysed to determine prevailing spread patterns for the local surrounding area. There are no ISI roses for Larch Hills West (within the AOI), nor Station Bay 2 due to their recent installation dates and lack of meaningful data.
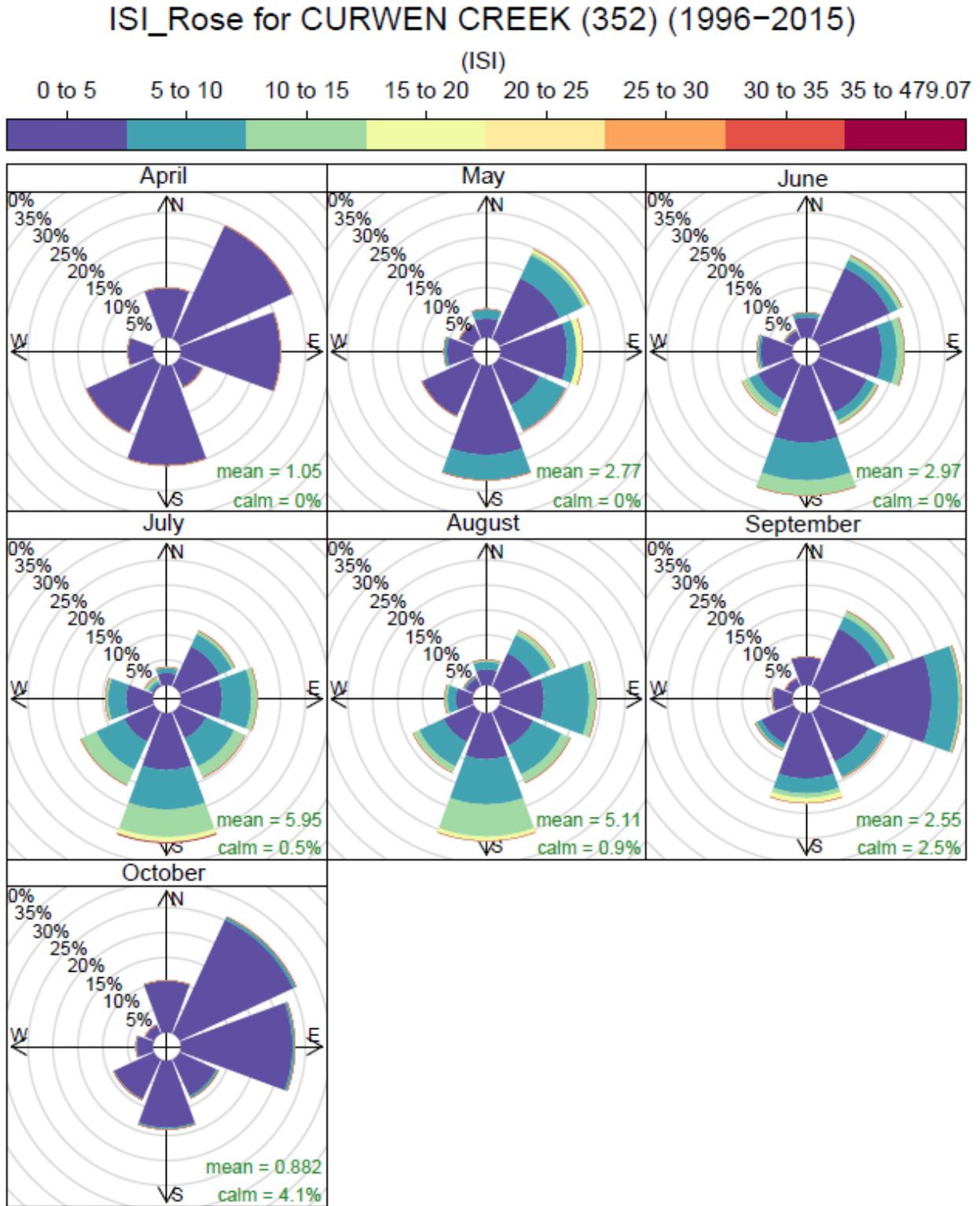
Figure 28: ISI Roses for the Curwen Creek weather station, provided by the BCWS
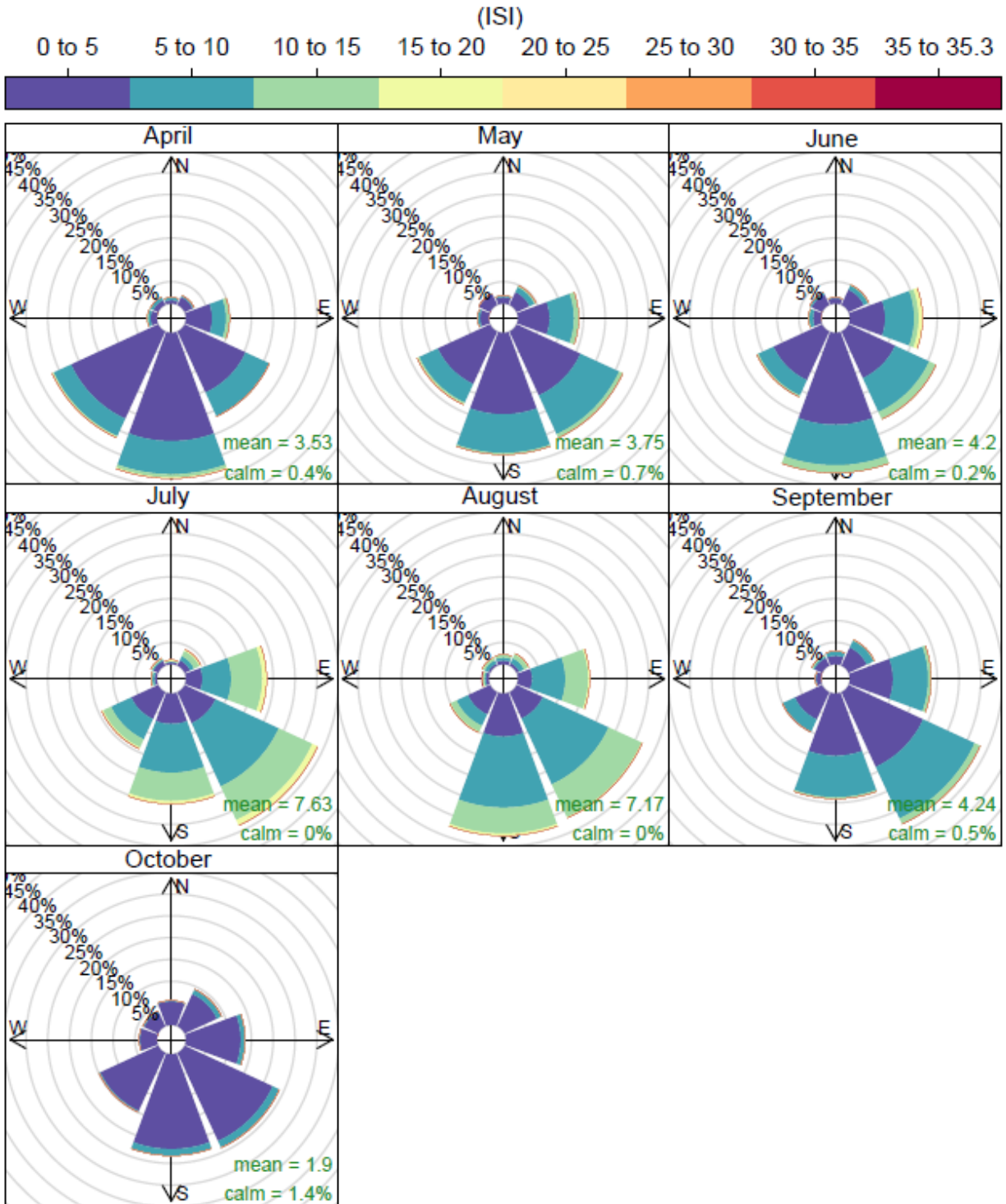
Figure 29: ISI Roses for the Fintry weather station, provided by the BCWS
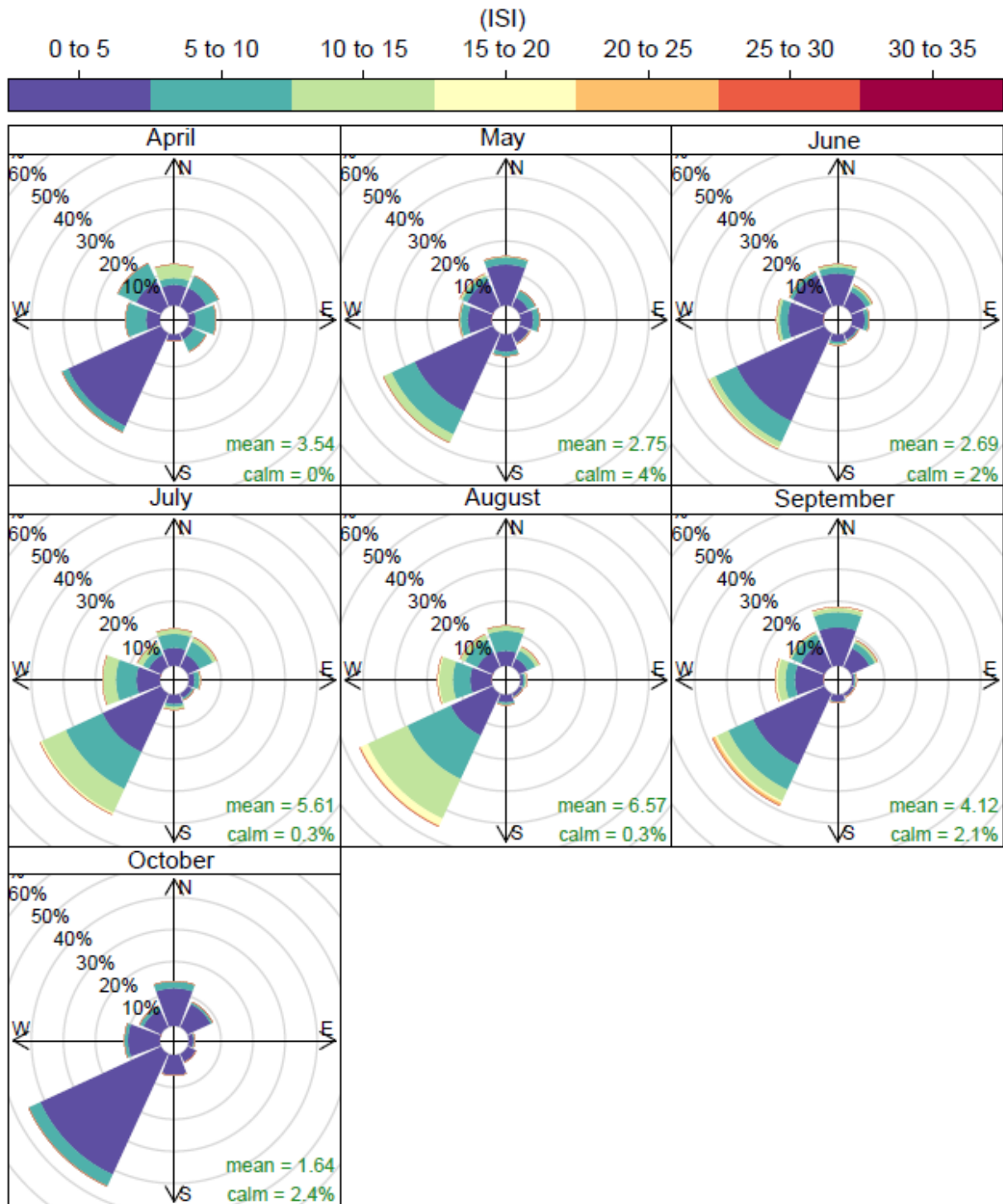
Figure 30: ISI Roses for the Kettle 2 weather station, provided by the BCWS
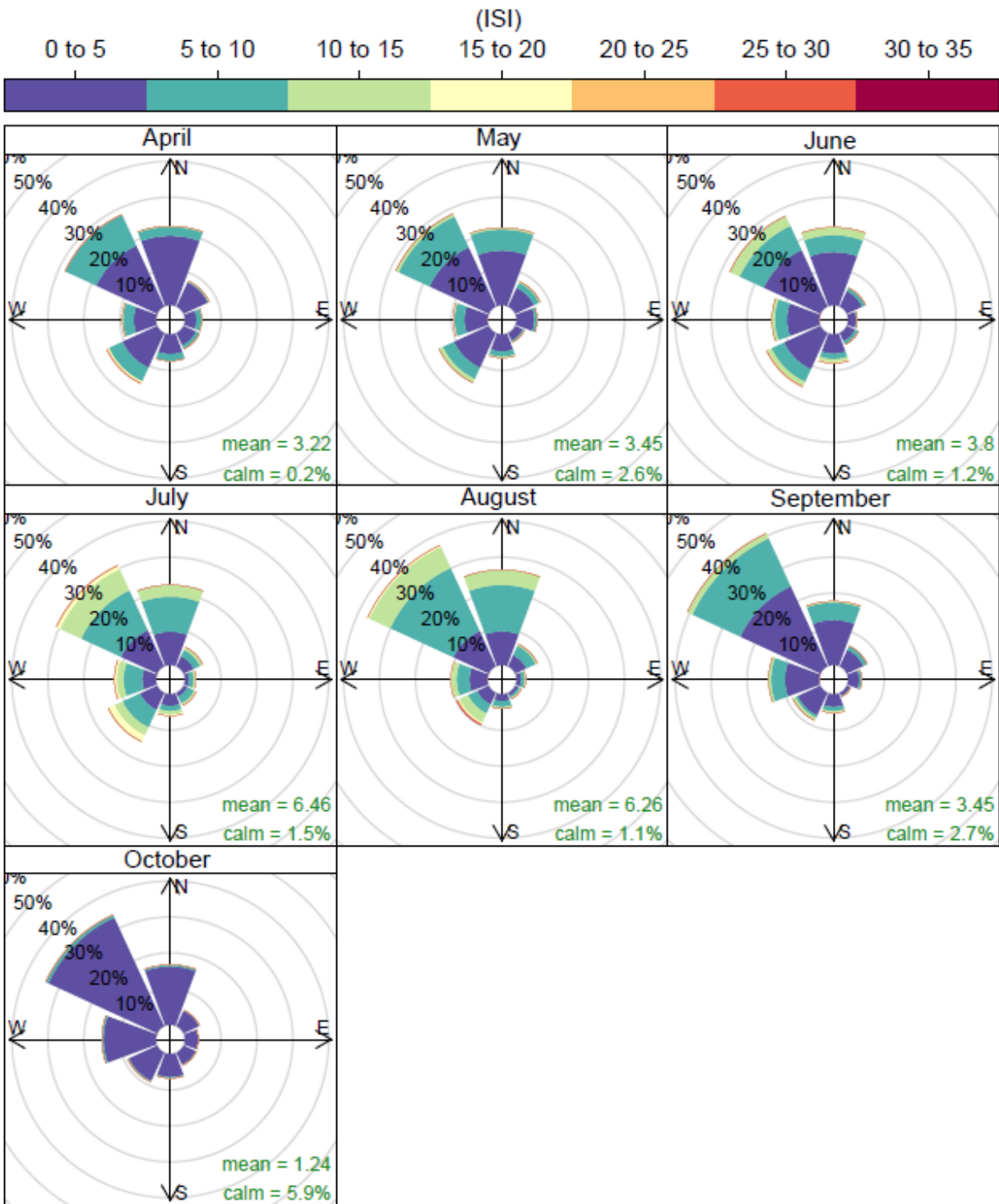
Figure 31: ISI Roses for the Mabel Lake 2 weather station, provided by the BCWS
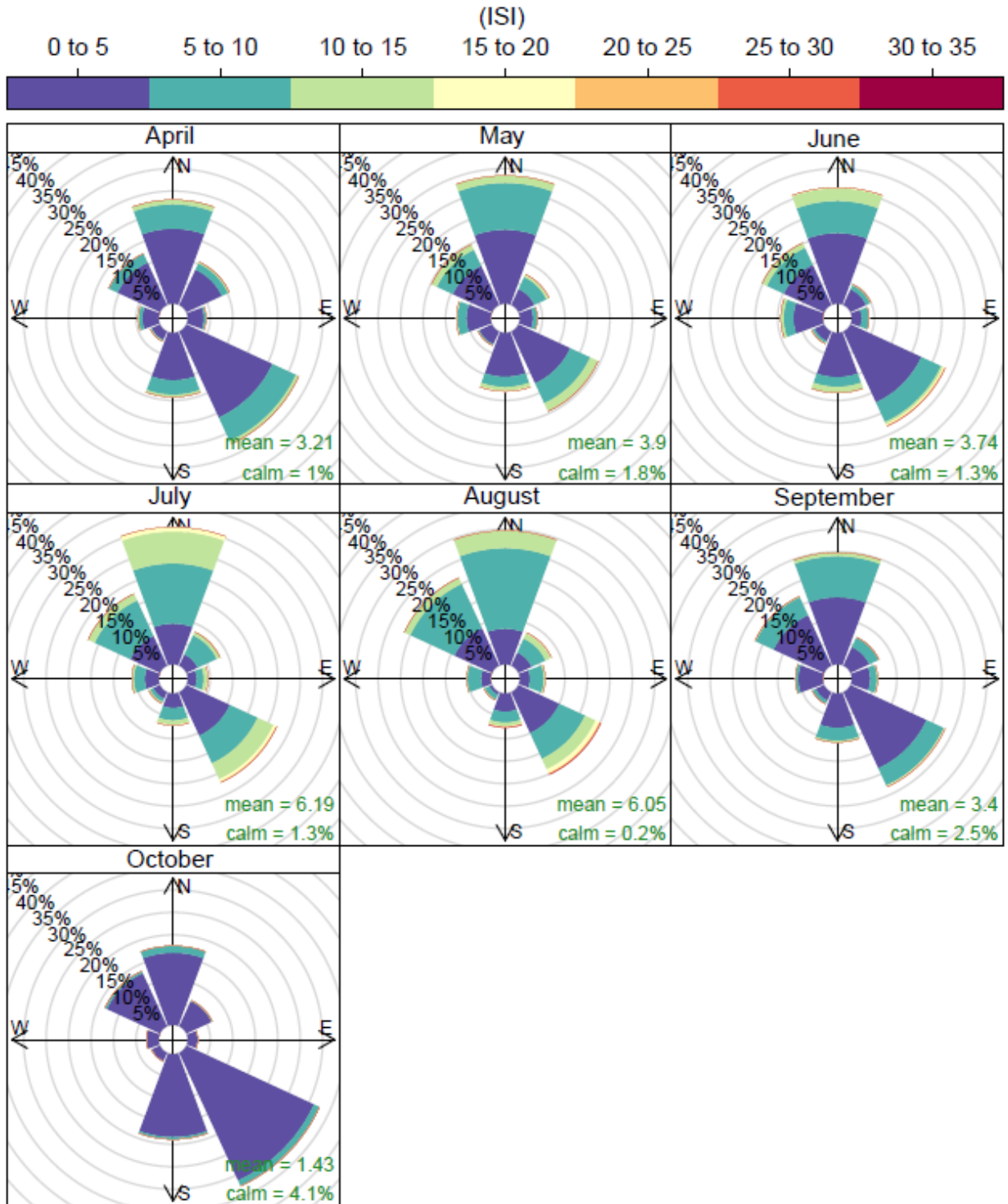
Figure 32: ISI Roses for the Salmon Arm weather station, provided by the BCWS

A2.4 Topography

Topography makes up one side of the fire environment triangle. In this context, topography describes land shape characteristics such as elevation, aspect, features (i.e., gullies, rolling hills, hummocks, rivers, etc.), and most importantly, slope steepness. Interpreting how slope affects fire behaviour is key to understanding how a fire will likely move through the landscape, since steepness strongly affects fire spread and intensity. Fire moves much quicker up a slope than it does on flat ground, all other factors equal. As a fire moves upslope, the smaller angle between the flames and the ground causes fuel to ignite easier compared with flat ground. In addition, heat transfers from the fire up the slope, preheating unburned fuels, and tilting flames closer to the ground, which increases the ignition rate. All these factors contribute to faster upslope fire spread. Table 30 describes general fire behaviour implications of various slope percent classes.

Table 30: Slope percentage and fire behaviour implications

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

Although steeper slopes contribute to faster moving fires, so do features such as narrow draws, gullies, and chimneys, where air naturally moves upslope more quickly, as it funnels up the feature. This can cause a chimney effect, with very high spread rates, increased spot fires, and erratic fire behaviour. Aspect is related to the direction the slope faces, where south- and west-facing slopes receive more sun, and higher temperatures than north- and east-facing slopes, which causes them to dry out quicker, and affects vegetation growth patterns.

This CWPP used the 2012 Wildfire Threat Assessment Guide (Morrow, Johnston, & Davies, 2012), which classifies slope slightly differently than subsequent guides. Notwithstanding, slope steepness is characterized in terms of how a fire will spread and behave. Slope is a primary input of the FBP system, and plays a significant role in wildfire threat assessments, mitigation work, and behaviour.

Where a value at risk is positioned on a slope is related to the degree of wildfire threat in terms of wildfire ability to gain momentum during an uphill run. A value located at the bottom of a slope is equivalent to a value located on flat ground; however, a value located on the upper 1/3 of a slope would be more threatened by a downslope approaching wildfire, due to more intense preheating, and faster spread rates compared with a value on flat ground (Figure 33). General fire behaviour implications of slope position of the value at risk are summarized in Table 31.
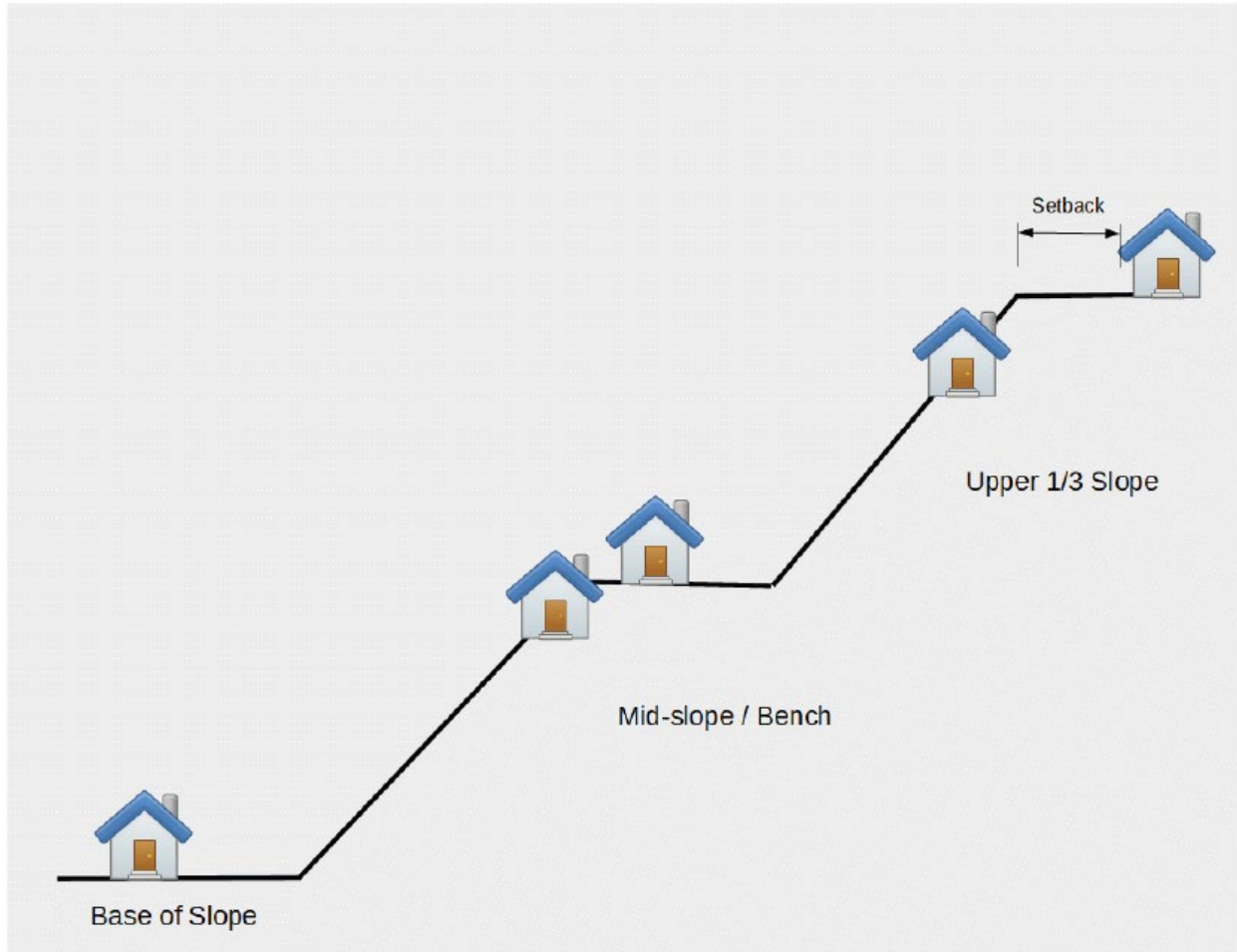
Figure 33: Graphic illustrating relative slope positions of values at risk

Table 31: Slope position of value at risk and fire behaviour implications

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

Where values are located on a flat bench, risk of wildfire damage depends on how far the value is set back from the slope crest. BC FireSmart recommends that structures are set back at least 10 m from the slope crest (BCWS, 2019). Regardless, structures located upslope of flammable vegetation are most at risk from wildfire. Frontline has developed a graphic to further illustrate structure set back from the edge of a slope Figure 34.
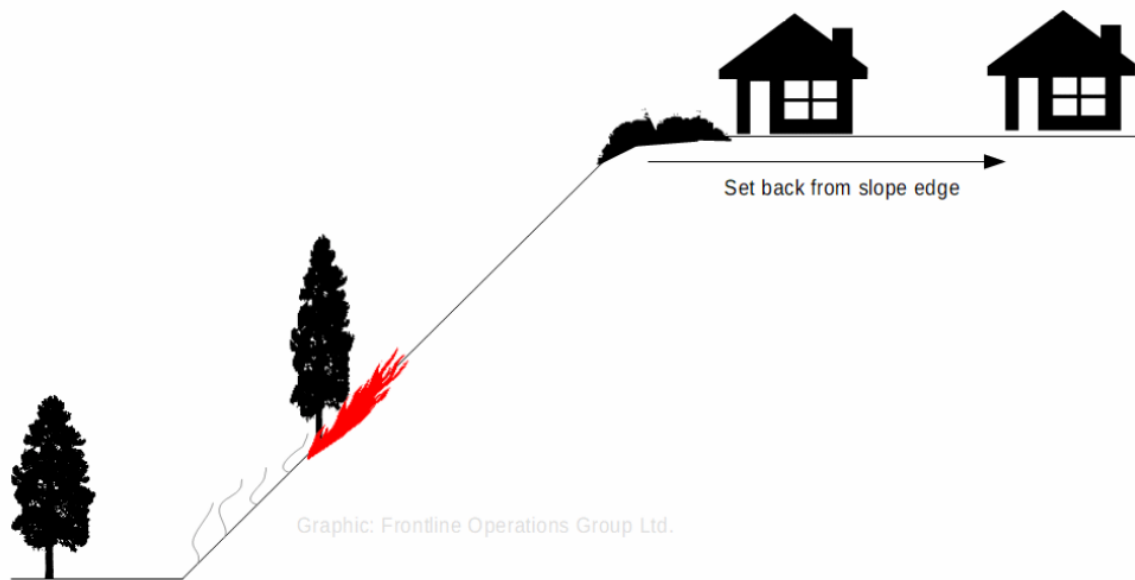
Figure 34: Graphic illustrating structure set back from slope crest in relation to upslope fire spread

A2.5 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 (see Table 32), 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 GIS layer. 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 FBP System provides quantitative outputs of selected fire behaviour characteristics for the major Canadian fuel types.

Fuel Types

Sixteen national benchmark fuel types, divided into five categories, are used by the FBP System to forecast how wildfire will react. As previously discussed, these fuel types were defined using the forest inventory and guidelines developed by FLNRORD. Eleven fuel types were identified in

the study area. Note that these fuel types represent fire behaviour pattern types. Names are generic, and often do not accurately describe the stand type.

Weather

Weather conditions used to calculate fire behaviour were derived from historic government records for five weather stations in the AOI proximity: Mabel Lake 2, Curwen Creek, Fintry, Salmon Arm, and Kettle 2. This weather data was analyzed to determine the average 90th percentile fire weather indices for FFMC and BUI, using the BCWS online calculator for the defined fire season.

Topography

Topographical attributes required to predict fire behaviour include slope and aspect. The AOI 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 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 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.

Table 32: Wildfire risk analysis methodology: fire behaviour layer 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

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 ISI value, and is adjusted for slope steepness, interactions between slope and wind direction, and increasing fuel availability, as accounted for through the BUI. 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 rate of spread, crown base height, and foliar moisture content, and is expressed as a percentage.

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 summarised in Table 33 and sub-section A1.7.

Table 33: Wildfire risk analysis methodology: Final wildfire threat ratings

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 BCWS.

A2.6 Local Wildfire Risk Classification

The 2012 Wildfire Threat Assessment methodology was used, so the local wildfire risk classification is not applicable.

A2.7 Summary of Local Wildfire Threat Classes

The following descriptions apply to the wildfire threat ratings listed in Table 33.

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; and
- 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.

A summary of the WUI Wildfire Threat Assessment scores from fieldwork worksheets is presented in Table 34 on the following page.

Table 34: WUI Wildfire Threat Assessment Scores for the AOI

COLLECTION_DATE	Admin_area	Plot_ID	UTM_Zone	Easting	Northing	Elevation (m)	Fuel_1	Fuel_2	Fuel_3	Fuel_4	Fuel_5	Fuel_6	Fuel_7	Fuel_8	Fuel_9	Fuel_10	Fuel_11	Fuel_Sub_Total	Weather_12	Weather_13	Weather_Sub_Total	Topograpgy_14	Topograpgy_15	Topograpgy_16	Topograpgy_17	Topography_Sub_Total	Wildfire_Behaviour_Threat_Score	Structural_18	Structural_19	Structural_20	WUI_Wildfire_Threat_Score	Total_Wildfire_Threat_Score	Wildfire_Behaviour_Threat_Class	WUI_Threat_Class
17/05/2021	RDNO_1	RDNO001	11U	391994	5553405	1138	3	5	4	1	1	2	0	0	2	0	10	28			0					0	28				0	28	M	N/A
17/05/2021	RDNO_1	RDNO002	11U	391985	5553368	1154	6	5	3	10	5	10	5	15	10	10	10	89	7	15	22	5	12	5	15	37	148	12	10	20	42	190	H	E
17/05/2021	RDNO_1	RDNO003	11U	389116	5561121	744	3	5	3	10	5	10	5	15	10	5	10	81	10	15	25	5	10	5	10	30	136	12	8	20	40	176	H	E
17/05/2021	RDNO_1	RDNO004	11U	384777	5567091	541	3	5	4	7	2	10	5	7	5	0	5	53	10	15	25	0	5	3	2	10	88				0	88	M	N/A
17/05/2021	RDNO_1	RDNO005	11U	385104	5566335	611	3	5	4	7	2	5	0	5	5	0	7	43	10	15	25	0	5	3	2	10	78				0	78	M	N/A
17/05/2021	RDNO_1	RDNO006	11U	385683	5569993	516	3	5	4	7	5	5	0	7	5	5	7	53	10	15	25	10	1	1	10	22	100	5	5	25	35	135	H	H
17/05/2021	RDNO_1	RDNO007	11U	391266	5581271	614	6	5	3	10	10	15	5	5	10	10	5	84	7	15	22	10	1	5	10	26	132	5	5	20	30	162	H	H
18/05/2021	RDNO_1	RDNO008	11U	377338	5590748	440	2	5	2	7	5	10	5	5	10	5	5	61	7	15	22	10	1	3	2	16	99	5	5	20	30	129	H	H
18/05/2021	RDNO_1	RDNO009	11U	376912	5590163	479	6	5	2	10	7	15	5	5	10	5	10	80	7	15	22	12	5	3	2	22	124	5	5	20	30	154	H	H
18/05/2021	RDNO_1	RDNO010	11U	371335	5572981	475	3	3	4	5	1	2	0	0	5	0	7	30	10	15	25	15	10	5	10	40	95				0	95	M	N/A
18/05/2021	RDNO_1	RDNO011	11U	370493	5573564	423	3	4	4	7	1	2	0	10	2	0	5	38	10	15	25	10	1	1	2	14	77				0	77	M	N/A
18/05/2021	RDNO_1	RDNO012	11U	370006	5573451	436	6	4	4	10	2	10	5	7	5	0	5	58	10	15	25	0	5	3	2	10	93				0	93	M	N/A
18/05/2021	RDNO_1	RDNO013	11U	363421	5565185	571	6	5	2	10	5	10	5	5	10	5	5	68	10	15	25	0	10	5	10	25	118	5	5	20	30	148	H	H
18/05/2021	RDNO_1	RDNO014	11U	362984	5563820	659	3	4	4	5	2	5	0	7	5	5	5	45	10	15	25	5	5	5	10	25	95				0	95	M	N/A
18/05/2021	RDNO_1	RDNO015	11U	376672	5562910	867	2	5	2	10	5	15	5	5	10	5	10	74	5	15	20	10	1	3	10	24	118	5	5	25	35	153	H	H
18/05/2021	RDNO_1	RDNO016	11U	354761	5562541	674	3	3	4	1	1	2	0	0	2	0	7	23			0					0	23				0	23	M	N/A
21/05/2021	RDNO_2	RDNO017	11U	356459	5620899	365	1	5	2	10	5	5	0	7	10	0	3	48	3	15	18	10	1	3	5	19	85				0	85	M	N/A
21/05/2021	RDNO_2	RDNO018	11U	349269	5619689	972	3	5	2	10	2	10	5	10	10	5	7	69	7	15	22	15	10	7	10	42	133	12	8	30	50	183	H	E

Threat Class:
L = Low   M = Moderate   H = High   E = Extreme

Appendix 3: Wildfire Threat Assessment Worksheets and Photos

The WUI Wildfire Threat Assessment Worksheets and Photos are provided as an attachment in a separate document in order to improve document functionality.