COMMUNITY WILDFIRE RESILIENCY PLAN 2022

City of Nelson

July 2023

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City of NELSON

SIGNATURES

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

RPF PRINTED NAME	DATE SIGNED
John Cathro	July 26, 2023
I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.	
Registered Professional Forester Signature and Seal	
	

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ACKNOWLEDGEMENTS

The authors would like to thank the following members of Nelson Fire & Rescue for their direct involvement with planning and review, and key contributions to the City of Nelson's Community Wildfire Resiliency Plan (CWRP):

- Jeff Hebert (Fire Chief)
- Heather Slack (Executive Assistant to the Director of Fire & Emergency Management)
- Scott Jeffery (Captain)

The following individuals also provided guidance, and feedback during the CWRP development process: Amanda Weber-Roy (Conservation Specialist, BC Parks); Amber Cooke, (Land and Resource Coordinator, Ministry of Forests); Angela French (Wildfire Mitigation Supervisor, Regional District of Central Kootenay); Art Westerhaug, (Wildfire Officer, BC Wildfire Service); Danika Swift (FireSmart Coordinator, Nelson Fire & Rescue); John Toplovec (Emergency Management Coordinator, Nelson Fire & Rescue); and Mark Tallman (Anderson Creek Timber) .

This report would not be possible without the Community Resiliency Investment (CRI) Program and funding from the Union of British Columbia Municipalities (UBCM).

EXECUTIVE SUMMARY

The Community Wildfire Resiliency Plan (CWRP) process (evolving from the Community Wildfire Protection Plan - CWPP) was created in British Columbia (BC) as a response to the devastating 2003 wildfire in Kelowna. As an integral part of the Community Resiliency Investment Program, managed by the Union of BC Municipalities, CWRPs aim to develop strategic recommendations based on the seven FireSmart principles (Education, Legislation and Planning, Development Considerations, Interagency Cooperation, Emergency Planning, and Vegetation Management) to assist communities in improving safety and reducing the risk of damage to property and critical infrastructure from wildfires.

This CWRP is an update to the City of Nelson's 2015 CWPP. The area of interest (AOI) for this plan is Nelson's municipal boundary. The CWRP provides Nelson with an updated action plan to mitigate the wildfire risk to the community. The plan can be used to guide the improvement and / or development of emergency and evacuation plans, emergency response, communication and education programs, bylaw development in areas of fire risk, and the management of potentially hazardous forests within the eligible Wildland Urban Interface (WUI).

A total of 33 recommendations and action items are presented in Table 1 below. The eligible WUI extends onto private land and land managed by other jurisdictions and agencies; thus, Nelson's capacity to implement action items may be limited in some instances, while other action items can be implemented directly. Ultimately, the recommendation and action items within this plan should be considered a toolbox of options to help reduce the wildfire threat to Nelson. The implementation of these recommendations should be prioritized based on guidance provided in Table 1 and throughout Section 5: FireSmart Principles, and as resources and funding allow.

FireSmart activities on private property and critical infrastructure (with a focus on a values-out approach, *i.e.,* starting with activities on the structure and then the surrounding areas immediately adjacent to the structure and continuing outwards) are critical recommendations put forward by this plan. The key to reducing structure loss in a WUI fire is to reduce a structure's ignitability. Mitigating the likelihood of structure loss should be the home and property owner's responsibility. Risk communication, education on the range of available activities, and the prioritization of activities should help home and property owners to feel empowered to complete simple risk reduction activities on their property.

Field work completed through this CWRP allowed for fuel types to be updated and verified and for wildfire threat assessments to be compiled through an office-based analysis; the result is an update to the local wildfire threat for Nelson's WUI. A key subcomponent of this analysis is the *wildfire behaviour threat class* (analyzing fuels, weather, and topography sub-components), which has the following classes:

- Very Low: Waterbodies with no forest or grassland fuels, posing no wildfire threat;
- Low: Developed and undeveloped land that will not support significant wildfire spread;

- Moderate: Developed and undeveloped land that will support surface fires that are unthreatening to homes and structures;
- High: Landscapes or stands that are continuous forested fuels that will support candling, intermittent crown or continuous crown fires. These landscapes are often steeper slopes, rough or broken terrain and/or south or west aspects. High polygons may include high indices of dead and downed conifers; and
- Extreme: Continuous forested land that will support intermittent or continuous crown fires.

The result of the analysis shows that ~*15% of Nelson's WUI has a moderate wildfire behavior threat or higher.* This, along with other analyses presented and discussed throughout the document, indicate that wildfire is a real threat to Nelson and its WUI. Nelson has begun planning and preparing for a wildfire emergency but should refer to this CWRP on how to continue this process effectively.

Table 1. City of Nelson's Community Wildfire Resiliency Action Plan

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Education (Section 5.1)							
Objective: provide information to communities and citizens empowering them to adopt and conduct FireSmart practices to mitigate the negative impacts of wildfire to their homes/businesses, properties, and neighbourhoods.							
1	Moderate	**This CWRP report and associated maps should be made publicly available on the City of Nelson website and social media.**	The CWRP may also be directly shared with local stakeholders who may be interested in collaborating on FireSmart and wildfire risk reduction activities.	City of Nelson (Communications or FireSmart Coordinator)	1 year	Available for download or viewing on the City's website.	Eligible for UBCM CRI funding.
2	High	**Continue to build up and conduct a FireSmart public education campaign within the municipality.**	Maintain and expand the strong level of resident engagement by continuing to host or participate in community events and info sessions. Consider hosting FireSmart workshops. Include education specific to Nelson such as best practices for landscaping, preferred materials for use when conducting home renovations, and safe debris removal methods. Promote the use of the *FireSmart Begins at Home* app to allow residents to self-assess their home for wildfire risk, and/or provide contact information to request a home assessment by a Local FireSmart Representative.	City of Nelson (Communications, Emergency Management, Fire & Rescue, FireSmart Coordinator)	Ongoing	Ongoing events scheduled throughout the year.	Eligible for UBCM CRI funding.

			The public education campaign should build on modes of engagement that have been previously successful (e.g., farmers' market booths), and pilot new public outreach strategies as well (e.g., targeting specific demographics such as tourists or seasonal residents). Identifying and focusing efforts on high-risk areas and properties is also recommended. A FireSmart public education campaign should also emphasize the accomplishments of the Nelson FireSmart Committee to date.				
3	High	**Continue to fund a full-time FireSmart Coordinator position.**	A full-time FireSmart Coordinator position will provide the person hours necessary to administrate the public education campaign, as well as residential-scale vegetation management incentive activities. Furthermore, continued funding from UBCM CRI will become contingent on maintaining this staff position, starting in the 2024 program year. Consider partnering with third party organizations such as Youth for Climate Action to recruit applicants and/or support initiatives where appropriate.	City of Nelson (Nelson Fire & Rescue)	Ongoing	FireSmart Coordinator remains on staff.	Eligible for UBCM CRI funding.
4	Low	**Engage with residents on strata land to promote the FireSmart Neighborhood Recognition Program.**	Strata land residents should be engaged specifically, in order to ensure that right-of-way and green space vegetation management is completed on areas that do not belong to the municipality. Consider engaging with neighborhood organizations or strata groups that Nelson Fire & Rescue already has a working relationship with. Review 'FireSmart Neighborhood	City of Nelson (Nelson Fire & Rescue, FireSmart Coordinator)	Ongoing	Engagement occurs with strata organizations.	Eligible for UBCM CRI funding.

			Recommendations' for priority neighborhoods.				
Legislation & Planning (Section 5.2)							
Objective: Provide the means for Nelson to implement wildfire risk reduction actions through bylaws and legislation by outlining local government responsibilities regarding wildfire							
5	Low	**Develop standard operating procedures that guide debris removal from hazard tree felling.**	'Downburst' storm events have resulted in a high frequency of windthrow events in forests, including on municipal lands, which can result in significant surface fuel loading. A management standard that details how to remove hazardous fine fuels while retaining beneficial habitat features (e.g., coarse woody debris, wildlife trees) should be developed and applied.	City of Nelson (Parks)	1 year	Standard operating procedures adopted.	Eligible for UBCM CRI funding.
6	High	**Implement the recommendations of the 2021 Source Water Protection Plan.**	It is possible that an interface wildfire, that ignites and burns in the City of Nelson watershed could result in adverse impacts to water quality. The recommendations of this plan, which specifically analyzes risk to drinking water supply, should be undertaken.	City of Nelson (Works)	6-8 years	Recommendations adopted.	Local government funding.
7	High	**Implement the recommendations of the *Nelson Next Climate Plan*.**	The *Nelson Next Climate Plan* incorporates recommendations for adapting to the changing climate that is associated with increased likelihood of wildfire (e.g., droughts, heat events) as well as to reduce the risk of an interface wildfire that this report endorses.	City of Nelson (Development Services & Climate Leadership)	Ongoing	Wildfire Development Permit Area section of Nelson Document reviewed and updated as necessary.	Eligible for UBCM CRI funding.
8	Moderate	**Review and update procedures for allowing permitted outdoor burning during for**	As discussed further in Section 5.7, there are challenges to hauling out yard waste and woody debris to tip at a landfill or chip. Currently, a brief window of time where residents may obtain a permit for backyard burning	City of Nelson (Fire & Rescue, FireSmart Coordinator)	2 years	Feasibility of FireSmart Backyard Burn permit determined; if feasible, permit	Eligible for UBCM CRI funding.

		residents, during the spring.	may be opened at the discretion of the Fire Chief. Usually this occurs in spring. The City should review and update the procedures associated with this program, to encourage further uptake and responsible participation in it. Consider assessing staff capacity, and consider the possibility of offering an online permitting system, as well as linking public outreach about this program to other FireSmart initiatives in the municipality.			system developed and adopted.	
Development Considerations (Section 5.3)							
Objective: To embed FireSmart practices and considerations into all development within Nelson.							
9	High	**Engage a qualified professional (such as a Local FireSmart Representative) to update or complete formal FireSmart assessments of critical infrastructure.**	Plan and implement action items in the sequence of critical infrastructure importance.	City of Nelson (Fire & Rescue, FireSmart Coordinator), consultant support	3 years	Critical infrastructure assessments completed and action items being planned for.	Eligible for UBCM CRI funding.
10	Low	**Use fire-resistant construction materials, building design, and landscaping for all critical infrastructure when completing upgrades or establishing new structures.**	Plan and implement action items in the sequence of critical infrastructure importance. Ensure that building design and materials align with low-carbon objectives and other climate-related policies.	City of Nelson (Development Services & Engineering) consultant support	Ongoing	New critical infrastructure is FireSmart.	Local government funding.

11	Moderate	**Conduct a study to determine neighborhoods at the highest risk of 'WUI disasters'**	WUI disasters occur when fire spreads rapidly from structure to structure, overwhelming the capacity of fire suppression resources. Consider conducting a spatial data modeling study to analyze structure density patterns and other neighborhood attributes, to determine areas in the City of Nelson that are most vulnerable to these events.	City of Nelson (Fire & Rescue, FireSmart Coordinator), consultant support	Study: 1-2 years Mitigation work: 6-8 years	Study feasibility is determined, and/or study completed.	Local government funding, potential eligibility for UBCM CRI funding, or Columbia Basin Trust funding.
Interagency Cooperation (Section 5.4)							
Objective: To broaden from a department or agency single jurisdiction-based approach to a risk driven, multi-agency and multi-scalable approach.							
12	High	**Hold regular meetings of the Nelson Community FireSmart & Resiliency Committee (CFRC).**	Meetings should occur regularly to ensure a coordinated approach to the fulfillment of recommendations. Furthermore, UBCM funding for wildfire risk reduction activities will become contingent on these regular meetings starting in the 2024 program year.	All parties involved in CFRC	Ongoing	Meetings held according to established schedule.	Eligible for UBCM CRI funding.
13	Moderate	**Create a communications plan for the CFRC.**	This should outline the CFRC's plan for information sharing with third parties, to ensure that messaging is efficient, effective, and consistent.	All parties involved in CFRC	1 year	Communications plan finalized.	Eligible for UBCM CRI funding.
14	High	**Evaluate opportunities to support Indigenous participation with the CFRC.**	Opportunities to support participation may include identifying available funding.	All parties involved in CFRC	Ongoing	Opportunities identified and invitations extended.	Eligible for UBCM CRI funding.
15	High	**The Nelson FireSmart Committee should meet regularly with Ministry of Forests' Wildfire Risk Reduction staff.**	Coordination between Wildfire Risk Reduction staff and the Nelson FireSmart Committee may accelerate hazard identification, prescription, and treatment of forest stands outside the municipal boundaries of the City of Nelson.	All parties involved in CFRC	Ongoing	Meetings held according to established schedule.	Eligible for UBCM CRI funding.

16	Moderate	**The CFRC should meet annually with Nelson Hydro and Fortis BC staff.**	Annual meetings should be held to follow up on projects and initiatives of relevance to each party. Consider focusing discussion on planned maintenance, planned monitoring of vegetation treatments, and the status of the 5-Year Maintenance Plan.	All parties involved in CFRC	Ongoing	Meetings held according to established schedule.	Eligible for UBCM CRI funding.
17	High	**Investigate novel solutions for treatment of private managed forest land.**	Engage with funding organizations (e.g., Columbia Basin Trust, UBCM CRI program officers), as well as forest professionals representing Anderson Creek Timber, to investigate novel solutions for treatment of Anderson Creek Timber land. Consider engaging as well with Nelson Cycling Club for potential volunteer work along established trails.	All parties involved in CFRC	Ongoing	Engagement held and feasibility of treatment in this area determined.	Local government funding.
18	Low	**Request information sharing from private critical infrastructure companies.**	Private critical infrastructure companies that have Crown tenure or private landholdings near the Nelson wildland-urban interface include Nelson Hydro, FortisBC, Teck Resources, and BC Hydro. Information sharing should occur to gather information about potential wildfire risk on these lands, and if hazard assessments or fuel management treatments have been undertaken.	City of Nelson (Fire & Rescue)	1 year	Invitation for information sharing extended.	UBCM CRI funding.
Cross-Training (Section 5.5)							
Objective: To support the development of comprehensive and effective wildfire risk reduction planning and activities, as well as a safe and effective response.							

19	Moderate	**Consider hosting an annual, in-person multi-agency training exercise with BCWS.**	Consider hosting in an area where multiple agency response is likely, such as West Arm Provincial Park, and inviting mutual aid partners to participate.	City of Nelson (Fire & Rescue, FireSmart Coordinator, Emergency Management Coordinator)	3 years	In-person exercise held.	Eligible for UBCM CRI funding.
20	High	**Host an annual tabletop training exercise with BCWS.**	While an in-person multi-agency exercise can be logistically challenging to organize annually, Nelson Fire & Rescue should consider hosting a tabletop exercise each year, to support a strong relationship with local BCWS staff.	City of Nelson (Fire & Rescue, FireSmart Coordinator)	Ongoing	Annual exercise held.	Eligible for UBCM CRI funding.
21	High	**Nelson Fire & Rescue should expand their in-house wildland-specific training program.**	Consider establishing an annual spring training refresher focused on interface wildfire response.	City of Nelson (Fire & Rescue)	Ongoing	Annual spring refresher training held.	Eligible for UBCM CRI funding.
22	High	**Maintain the number of members holding SPP-WFF1 certification and expand the number of members with additional wildland firefighting certifications.**	Additional training opportunities in which members could participate include S-185, S-231, WSPP-115, or as task force leader.	City of Nelson (Fire & Rescue)	Ongoing	Number of members with additional certifications expanded.	Eligible for UBCM CRI funding.
23	Moderate	**Pursue funding to enable Nelson Fire & Rescue members to attend the FireSmart Symposium or Wildland Urban**	Relevant learnings should be shared at CFRC meetings.	City of Nelson (Fire & Rescue)	Ongoing	Attendance at 2023 symposium(s).	Eligible for UBCM CRI funding.

		Interface Symposium.					
24	Moderate	**Pursue funding to enable Nelson Fire & Rescue members to complete Structural Protection Unit training.**	Ensure that training for Nelson Fire & Rescue members is upgraded and maintained concurrently with equipment upgrades.	City of Nelson (Fire & Rescue)	Ongoing	Training completed.	Eligible for UBCM CRI funding.
Emergency Planning (Section 5.6)							
Objective: To create specific wildfire response pre-incident plans so those responding to a wildfire emergency know who is available to help with what and when, and to improve Nelson's ability to respond to (during and after) a wildfire emergency.							
25	Moderate	**Update the equipment inventory of the Structural Protection Unit, including storage, to provincial deployment standards.**	Seek out funding to support this. Upgrading the Structural Protection Unit will allow Nelson Fire & Rescue members to be deployed as provincial resources and work with BCWS in other interface wildfire incidents, which provides valuable experience to firefighters.	City of Nelson (Fire & Rescue)	3-5 years	Structural Protection Unit is provincially deployable.	Eligible for UBCM CRI funding.
26	Moderate	**Develop a rooftop sprinkler plan and distribution pilot program.**	Prior to distribution of residential rooftop sprinklers, formalize water availability planning and establish a standard procedure for the use of these devices. Once planning is in place, make rooftop sprinkler devices available to residents. Ensure participating residents are supported with education and resources for additional FireSmart measures they can take to protect their homes.	City of Nelson (Fire & Rescue, FireSmart Coordinator)	3 years	Plan is completed.	Eligible for UBCM CRI funding.

27	High	**Complete evacuation route planning for the City.**	At the time of writing, funding has been secured and planning begun for a city-wide evacuation plan.	City of Nelson (Emergency Management Coordinator, Nelson Fire & Rescue)	1 year	Evacuation plan completed and adopted.	Local government funding.
28	High	**Conduct a drill of the evacuation plan, when completed.**	Consider focusing this drill in interface areas or areas with known access and egress issues.	City of Nelson (Emergency Management Coordinator, Nelson Fire & Rescue)	1-3 years	Drill occurs.	Potential eligibility for UBCM CRI funding.
29	Moderate	**Complete a wildfire incident pre-plan.**	Engage with BC Parks, evaluate the feasibility of completing this plan in tandem with West Arm Provincial Park.	City of Nelson (Emergency Management Coordinator, Nelson Fire & Rescue)	5 years	Wildfire incident pre-plan developed and adopted.	Eligibility for UBCM CRI funding.
30	Moderate	**Consider maintaining availability of clean air and cooling spaces at public facilities during heat wave and air quality advisory alert periods.**	Consider also installing open-source air quality monitors to collect locally relevant data and proactively communicate this information with vulnerable residents. Exposure to smoke can affect residents' health.	City of Nelson (Emergency Management Coordinator, FireSmart Coordinator)	Ongoing	Promotion of clean air and cooling spaces occurs.	Potential eligibility for UBCM CRI funding, local government funding.
Vegetation Management (Section 5.7)							
Objective: reduce the potential wildfire intensity and ember exposure to people, infrastructure, structures, and other values through manipulation of both the natural and cultivated vegetation that is within or adjacent to a community.							
31	High	**Proceed with detailed assessment, prescription development, and treatment of fuel treatment units**	Treatment sites that fall outside of municipal boundaries will require coordination with Ministry of Forests Wildfire Risk Reduction staff to implement.	City of Nelson	7 years	Prescriptions written and implemented for all proposed treatment units.	Eligible for UBCM CRI funding.

		identified and prioritized in this CWRP.					
32	Moderate	**As part of fuel treatment implementation, Nelson should develop interpretive signage to demonstrate pre- and post-fuel treatment forest stands conditions.**	Interpretive signage could include text explaining the purpose of the fuel management treatment, connection to the CWRP, and FireSmart practices residents nearby can use to reduce wildfire hazards around their yards and homes.	City of Nelson	5 years	Signage installed during implementation phases.	Eligible for UBCM CRI funding.
33	High	**When operational fuel treatments are conducted, re-assessment should occur 10 years after treatment by a qualified professional. This can be completed with a CWRP update or as a stand-alone exercise.**	A more specific date for reassessment could be identified when fuel management prescriptions for treatment of the recommended areas are developed. Re-assessment could also occur during the next iteration of the CWRP.	City of Nelson, consultant support	Ongoing	Monitoring scheduled and completed.	Eligible for UBCM CRI funding.

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FREQUENTLY USED ACRONYMS

AOI	Area of Interest
BC	British Columbia
BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CFRC	Community FireSmart & Resiliency Committee
FCFS	FireSmart Community Funding and Support program
CI	Critical Infrastructure
CIIZ	Critical Infrastructure Ignition Zone
CRI	Community Resiliency Investment
CWPP	Community Wildfire Protection Plan
CWRP	Community Wildfire Resiliency Plan
DPA	Development Permit Area
EMBC	Emergency Management British Columbia
FBPS	Fire Behavior Prediction System
FESBC	Forest Enhancement Society of British Columbia
FESIMS	Forest Enhancement Society Information Management System
FPA	Fire Protection Area
FSCCRP	FireSmart Canada Community Recognition Program
HIZ	Home Ignition Zone
HRVA	Hazard Risk and Vulnerability Analysis
LRMP	Land and Resource Management Plan
MOF	Ministry of Forests
MOTI	Ministry of Transportation and Infrastructure
NDT	Natural Disturbance Type
PSTA	Provincial Strategic Threat Assessment
OCP	Official Community Plan
UBCM	Union of British Columbia Municipalities
VAR	Values at Risk
WRR	Wildfire Risk Reduction
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

In March 2021, B.A. Blackwell and Associates Ltd. was retained to assist the City of Nelson (Nelson) in developing a Community Wildfire Resiliency Plan, hereinafter referred to as the CWRP. This CWRP revisits areas assessed in Nelson's 2015 Community Wildfire Protection Plan (CWPP), but with a focus on updated BC Wildfire Service (BCWS) fuel type mapping, an improved wildfire threat analysis methodology, and the seven FireSmart principles. This plan accounts for changes that have occurred in the past ten years and takes advantage of the newest community wildfire planning framework in BC.

Recent wildfire disasters like those experienced in Slave Lake, Alberta (2011), Washington State (2014, 2015), Fort McMurray, Alberta (2016), BC (2017, 2018), and California (2017, 2018, 2020) all display the vulnerability of communities and the potential toll of wildfires on families, neighbourhoods, public health, and the economy of entire regions. The devastating 2017 and 2018 wildfire seasons in BC resulted in unprecedented areas burned (1.2 million ha burned in 2017, followed by 1.3 million ha in 2018); thousands of evacuations in 2018 and tens of thousands of evacuations in 2017; and hundreds of millions of dollars in wildfire suppression costs. These events, along with important advances in loss prevention programs, have spurred the need for greater consideration and due diligence with respect to fire risk in the wildland urban interface (WUI).[1] CWRPs are an invaluable opportunity to proactively manage wildfire risk and increase community resilience to wildfire.

1.1 PLAN GOALS

The purpose of this CWRP is to identify and update the wildfire risk specific to Nelson and the surrounding eligible WUI, to describe the potential consequences of wildfire to the community, and to examine options and strategies to reduce potential wildfire risks. This CWRP provides a reassessment of the level of wildfire risk to Nelson and provides a current and accurate understanding of the threats to human life, property, and critical infrastructure faced from wildfire. The goal of this CWRP is to provide Nelson with a framework to inform the implementation of specific actions and strategies to:

1) increase the efficacy of fire suppression and emergency response;
2) reduce potential impacts and losses to property and critical infrastructure from wildfire; and
3) reduce wildfire behavior threat within the community.

To help guide and accomplish the above strategies, this CWRP will provide Nelson with:

1) an updated assessment of wildfire risk to the community;
2) an updated assessment of values at risk and potential consequences from wildfire;
3) maps of fuel types and recommended areas for fuel treatments;
4) an updated assessment of emergency response capacity and community FireSmart status; and

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

5) options and strategies to reduce wildfire risk in the seven FireSmart disciplines: education, legislation and planning, development considerations, interagency cooperation, cross-training, emergency planning, and vegetation management.

CWRPs are funded in BC by the Union of BC Municipalities (UBCM) under the Community Resiliency Investment (CRI) FireSmart Community Funding and Supports Program. As per funding requirements, this CWRP is completed according to the 2021 CRI template.

1.2 PLAN DEVELOPMENT SUMMARY

The planning for this CWRP was based on applying Nelson's municipal boundaries as the project's area of interest (AOI). From this, the associated eligible wildland-urban interface, (referred to afterwards in this document as the WUI) was mapped to derive the plan's focus area. The WUI represents a one-kilometer buffer around areas with a structure density of 6+ structures / km^2 within the AOI. See Map 1 for additional details.

The CWRP development process consisted of four general phases:

1. Consultation

Key players were assembled to form Nelson's Community FireSmart Resiliency Committee (CFRC). The CFRC for Nelson includes the key planners and responders involved in Nelson's local FireSmart initiatives, wildfire resiliency planning, and wildfire and emergency response management. The CFRC is further described in Section 5.4.

Meetings were planned to obtain information on wildfire risk mitigation initiatives currently in place or completed; review existing plans, policies, bylaws, and current resources; identify areas of concern and vulnerabilities; and to determine priorities and potential mitigation strategies. Members of the CFRC were consulted at the onset of the project planning phase via questionnaires and a virtual meeting, and concurrently throughout plan development. The CFRC was integral in the CWRP review process and approval.

Information sharing took place with First Nations identified through the consultation area database regarding the locations of potential fuel treatments and to identify any potential cultural values at risk requiring protection.

2. Review of Relevant Plans and Legislation

All municipal, regional, and provincial bylaws, policies, plans, and guidelines were reviewed, and sections within that are relevant to the CWRP are identified.

3. Identification of Values at Risk and Wildfire Risk Assessment

The identified values at risk are described in Section 3: Community Description and concepts of wildfire threat and risk are elaborated on in Section 3.2.7. The wildfire threat to Nelson was assessed through review of the natural fire regime and ecology, and the local wildfire threat assessment.

4. Developing an Action Plan

An effective wildfire risk reduction action plan (including leading and participating entities, a timeframe for action/completion, metric for success, and estimated cost and/or hours to complete) was developed considering a full range of activities relating to the following seven FireSmart disciplines:

- Education (Section 5.1)
- Legislation and Planning (Section 5.2)
- Development Considerations (Section 5.3)
- Interagency Cooperation (Section 5.4)
- Cross-training (Section 5.5)
- Emergency Planning (Section 5.6)
- Vegetation Management (Section 5.7)

The following next steps are a suggested route towards operationalizing the recommendations detailed in this CWRP*:*

1. The CFRC should continue to meet periodically, as needed to coordinate the fulfillment of this report's recommendations (consider annually or bi-annually, before or during the fire season).
    a. Meetings could include some or all of the parties identified in Section 5.4.
2. Consider identifying recommendations to allocate resources to and pursue funding for the next UBCM CRI funding intake at this time.
    a. The City of Nelson will apply for separate UBCM CRI funding and compile final reporting, unless specific joint regional initiatives are occurring.
    b. Continued meetings of the CFRC would be a suitable venue to identify if additional support is needed to fulfill the targeted recommendations.
        i. Additional support might be required in order to coordinate activities that will bridge more than one funding year (i.e., prioritizing the prescription and supervision of vegetation management; coordinating plan and policy review) or that require more time and resources than is currently available to any one CFRC member (e.g., potentially some FireSmart education recommendations).
        ii. Consultant support or a term contract salary could be incorporated into the UBCM CRI application accordingly.
3. In subsequent meetings, members from different agencies could share information about actions taken to fulfill recommendations.
    a. Documentation of the status of CWRP recommendations could be compiled and maintained alongside these meetings.

SECTION 2: RELATIONSHIP TO OTHER PLANS

Wildfire can affect all aspects of a community. As a result, there are many plans that relate to this CWRP. The intent of this section is to review all municipal, regional, and provincial bylaws, policies, plans, and guidelines and identify any sections that are relevant to wildfire emergency planning and response.

2.1 LOCAL AUTHORITY EMERGENCY PLAN

Nelson's emergency management planning is governed by the newly established Emergency Management Program bylaw, which was passed in 2018 and created an emergency management program in Nelson for the first time. Prior to this, Nelson had participated in the Regional District of Central Kootenay's emergency management program. This new program is tailored to Nelson's specific needs and guided by higher level legislation and standards such as the Emergency Program Act[2] and the BC Emergency Management System, and is administered by the Director of Emergency Management and the Emergency Program Coordinator.

Additionally, at the time of writing, Nelson is in the process of developing a community-wide evacuation plan. This plan and emergency planning in Nelson are further discussed in Section 5.6: Emergency Planning.

2.2 LINKAGES TO OTHER CWPPS / CWRPS

City of Nelson Community Wildfire Protection Plan[3]

In 2015, B.A. Blackwell & Associates completed a Community Wildfire Protection Plan update for Nelson. Most of the recommendations (23 of 32) made in the 2015 CWPP have been completed as the result of several key initiatives undertaken by Nelson. This CWRP recommends actions to expand and enhance these initiatives.

Key wildfire risk reduction initiatives (and location of follow-up discussion in this CWRP):

- Developing and delivering FireSmart public education programming and risk reduction initiatives for residents *(Section 5.1 and 5.7)*
- Revising Development Permit Area 3 (Wildfire Interface Zone) standards and implementing a -wide landscaping standard *(Section 5.3)*
- Establishing Nelson's own Emergency Management Program (*Section 5.6)*
- Collaborating with other local agencies to share information and complete fuel management projects *(Section 5.4)*
- Completing a fuel management projects within and around the municipality. *(Section 5.7)*

[2] British Columbia Provincial Government, 2020. Emergency Program Act. Retrieved from: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/00_96111_01

[3] City of Nelson (B.A. Blackwell & Associates). (2015). *City of Nelson Community Wildfire Protection Plan.*

The remaining recommendations that were not fulfilled are reviewed throughout Section 5: FireSmart Principles. Some recommendations remain relevant and have been adopted into the recommendations made in this CWRP, while others have not. Table 2 shows the unfulfilled 2015 CWPP recommendations, and the location of follow-up discussion in this CWRP.

Table 2. Unfulfilled recommendations from the City of Nelson Community Wildfire Protection Plan (2015) and follow-up discussion within this CWRP.

2015 CWPP Recommendation	2022 CWRP *Follow-Up Discussion*
Recommendation #1: Establish / expand a school education program to engage youth in wildfire management. Consult ABCFP and BCWS (the zone) to facilitate and recruit volunteer teachers and experts to help with curriculum development and to be delivered in elementary and/or secondary schools. Educational programming can be done in conjunction with currently running programs on fire extinguisher training.	***Section 5.1*** *reviews current FireSmart education initiatives and identifies opportunities for development.*
Recommendation #6: Consider local planning departments to develop regional development permit standards, provide a group voice to the Building and Safety Standards Branch and other provincial entities, and align municipal bylaws.	***Section 5.3*** *reviews updates and current priorities for planning and development strategy in the City of Nelson.*
Recommendation #19: The City should consider altering the zoning bylaw to require that developers leave building set backs on private land so that there is a minimum of 10 m distance between buildings and forest interface. The City should consider applying this standard to housing bordering both City owned and forested private land.	
Recommendation #29: Require that all new interface developments have a secondary access road.	
Recommendation #22: Integrate Emergency Preparedness Committee and West Arm Interface Steering Committee. Coordination and information sharing are crucial to the development of a community well prepared for wildfire.	***Section 5.4*** *describes interagency initiatives that have occurred over the past five years.*
Recommendation #21: Conduct annual structural and interface training with the BCWS. As part of the training, it is recommended to conduct annual reviews to ensure PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. Interface training may include completion of a mock wildfire simulation in coordination with BCWS and safety training specific to wildland fire and risks inherent with natural areas.	***Section 5.5*** *refreshes recommendations for structural and interface training with BCWS.*

Recommendation #9: Consider completing a fire flow / water vulnerability assessment for each water system to identify and map all viable alternative water sources (reservoirs, streams, lakes, etc.). Identify areas where water availability may be improved and provide recommendations to reduce City's vulnerability.	
Recommendation #10: Consider completing a vulnerability assessment of all critical infrastructure in interface areas with FireSmart recommendations.	
Recommendation #11: Consider developing a relay pumping plan from Kootenay Lake and water sources at height, which may supplement emergency firefighting water requirements (not for drinking water).	
Recommendation #12: Consider completing a detailed review of back-up power source options for all critical infrastructure and upgrade as required.	***Section 5.6*** *reviews updates and current priorities for emergency planning in the City of Nelson, including studies, analyses, and plans.*
Recommendation #13: Consider completing more detailed hazard assessments and proactively (in advance of wildfire) developing response plans for stabilization and rehabilitation of burn areas in watersheds that are vulnerable to post-wildfire debris flows and floods. Opportunities may exist to coordinate study and planning with adjacent jurisdictions (i.e., RDCK and BC Parks). Refer to Section 4.2.1 for a description of potential debris hazards.	
Recommendation #27: Conduct fire pre-plan assessment for key interface areas in the City of Nelson. Other jurisdictions have completed assessments that prioritize fire department-specific variables, such as distance to hydrants, response time from nearest fire station, etc., to produce local risk ratings.	
Recommendation #28: Develop a Total Access Plan to create, map, and inventory trail and road network in natural areas for suppression planning, identification of areas with insufficient access, and to aid in strategic planning. The plan should be updated every five years, or more regularly, as needed to incorporate additions or changes.	

2.3 CITY OF NELSON OFFICIAL COMMUNITY PLAN (2013)

An Official Community Plan expresses the objectives and policies of the local government and provides Nelson with a long-range framework to guide, monitor, and evaluate future land use and development.

Table 3 below summarizes the objectives and policies within Nelson's Official Community Plan (OCP) that are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster.

Table 3: Summary of Nelson's Official Community Plan emergency and wildfire-related objectives and policies and their relationship to this CWRP.

Section	Policy Description / *Relationship to CWRP*
4.2 Land Use & Neighborhoods	**Objective**: "To increase the supply of available building sites and to encourage residential infill in residential neighbourhoods." *This objective and associated policies (including those relating to revitalization of vacant properties, enhancing policies for building of secondary suites, and Zoning Bylaw revisions) direct neighborhood development towards patterns of residential infill and densification. New neighborhood construction in undeveloped forested areas is not emphasized.*
4.9 Natural Environment and Hazardous Conditions	**Objective:** "To reduce the risk of wildfire through awareness, prevention, regulation and other mitigation measures." • **Policy: "**The City will consider mitigation efforts in the Wildland Urban Interface, to reduce fire exposure to residents, including building community awareness" • **Policy:** "The City will review its Building Bylaw to revise it to include recommendations from the City Wildfire Protection Plan." • **Policy:** "The City will continue to use development permits, building • regulations and public education as tools to ensure that developments incorporate fireguards, defensible space and appropriate fire-resistant building materials in wildfire interface areas." • **Policy:** "The City will monitor the implementation and effectiveness of the Tree Management Plan and the Municipal Tree Bylaw." • **Policy:** "In recognition of the wildfire hazard posed by coniferous trees within ten metres of a structure, City planting of urban street and park trees will emphasize Deciduous Trees, naturally occurring shrubs and ground vegetation." *This objective specifies the City of Nelson's mandate to reduce the risk of wildfire for community residents and associated policies detail the actions the City will take to achieve this.*
4.10 Development Permits Development Permit Area #3 – Natural Environment and Hazardous Lands	**Objective**: "To protect areas of ecological sensitivity and to ensure personal and public safety in areas where environmental concerns pose a risk to development. These areas may include water courses, riparian zones, steep slopes, wildlife habitat, and wildfire interface zones." • **Policy**: "To protect future development from natural events such as wildfire by reviewing Wildfire Interface design guidelines to ensure they continue to provide the necessary guidelines for construction within the wildfire interface areas." *Building design and neighborhood development patterns strongly influence a community's resiliency, or vulnerability, to impacts of wildfire (see Section 5.3). Development Permits are policy tools to influence building design and community development.*

2.4 LOCAL BYLAWS

Table 4 contains local policies that are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster.

Table 4: Summary of local wildfire and emergency related bylaws

Bylaw	Description and Relationship to CWRP
Official Community Plan Bylaw No. 3247, 2013	A bylaw to adopt the City of Nelson's 2013 Official Community Plan.
Emergency Management Program Bylaw No. 3431, 2018	A bylaw to establish an emergency management program within the City of Nelson. • *Establishes the Executive Emergency Management Committee, the Emergency Management Planning Committee, and the Emergency Management Director, Manager, or Coordinator position.* • *Mandates the development of emergency plans by the Emergency Management Planning Committee.* • *Mandates the establishment of an Emergency Operations Centre for the City.*
Off-Street Parking and Landscape Bylaw No. 3274, 2013	A bylaw to regulate off-street parking and landscaping within the City of Nelson. Revised in 2019 to prohibit flammable conifer vegetation from being planted within 1.5 meters of structures (existing landscaping exempt), and add compliance with FireSmart landscaping guidelines to the Wildfire Design Guidelines that apply to the Development Permit Area around the wildland-urban interface.
Clean Air and Smoking Regulation Bylaw No. 3378, 2017	A bylaw to promote clean air and regulate smoking in the City of Nelson. • *Prohibits smoking in public buildings and public parks, including the city cemetery.*
Parks Bylaw No. 3330, 2016	A bylaw to regulate the use of parks within the City of Nelson. • *Among other specifications, dumping, use of combustible materials or firearms, and fires in parks or open spaces are prohibited.*

2.5 OTHER LOCAL PLANS

Table 5 contains other local plans and policies that are directly relevant to the CWRP.

Table 5: Summary of other Local Plans and Policies relating to the CWRP

Plan	Description and Relationship to CWRP
Nelson Hydro Five-Year Integrated Vegetation Management Plan (2022)	This plan was developed to improve vegetation management and its effects on power utility, while complying with relevant federal and provincial regulations, as well as Nelson Hydro Best Management Practices. Vegetation management is scheduled by zones within the Nelson Hydro operating area. The risk of interface wildfire is acknowledged in discussion of areas of 'emergent vegetation' – areas that previously have been overlooked and should be prioritized for vegetation management immediately.

City of Nelson
Source Water Protection Plan (2021)
	The Source Water Protection Plan is part of a "multi-barrier approach to drinking water protection." The development of this plan was mandated as a condition of the City of Nelson's operating permit by the Interior Health Authority.
	Plan findings relevant to this report include:
	• The main issues and possible impacts to source water quality were identified and include wildfire, forest health impacts, and climate change.
	• A "Phase 1 Source Assessment" identified the following key hazards to water quality, and rated the risk associated with them as "*Very High*":
	  ○ "Changes in watershed hydrology associated with forest health changes."
	  ○ "Sedimentation and hydrology effects associated with wildfire and with wildfire fighting efforts."
	  ○ "Potential loss of control /access or damage at the intake due to wildfire."
	Recommendations made in the Source Water Protection Plan, relevant to this report include:
	• "Implement the high priority recommendations of the CWPP, including maintaining the Interface Working Group to coordinate risk reduction efforts."
	• "Continue to implement fuel mitigation projects to mitigate fire risk around sensitive infrastructure."

Nelson Hydro Vegetation Management Best Practices (2021)	This plan identifies vegetation management procedures and best practices to protect the public, infrastructure, and values adjacent to Nelson Hydro transmission distribution lines. The plan identifies wildfire as an important consideration for vegetation management planning in the Nelson Hydro operating area, noting that within the drier ecosystems of this area, there is a possibility of frequent recurrence of fire. Debris disposal specifications are identified, in order to prevent hazardous accumulations of woody debris after manual and mechanical vegetation treatments. A monitoring program is proposed in order to ensure debris disposal specifications are adhered to.
City of Nelson Nelson Next Climate Plan (2020)	This plan is a comprehensive framework to guide City's actions aimed at reducing greenhouse gases and reducing vulnerability to climate change impacts, and discusses the following: • Key climate trends for the City of Nelson. • Key climate risks for the City of Nelson, including interface wildfire (rated an 'extreme' risk). • Climate change priorities based on risk analysis and community feedback, including adaptation to interface wildfire. • Tactics to meet climate 'aspirations', including:

Plan	Description and Relationship to CWRP
	○ Collaborate with local organizations and other levels of government to develop agroforestry projects in high-risk wildfire areas directly surrounding Nelson; ○ Continue implementing the high priority actions from Nelson's Community Wildfire Protection Plan and lobby other levels of government for increased support; ○ Develop Emergency Water Supply Plans for drinking water and Fire and Rescue Services use; and ○ Expand Nelson's DP Area 3 Zone (Wildfire Design Guidelines) to include all buildings and structures within City limits (new and additions). • State of climate adaption in the City of Nelson: ○ *Emergency preparedness* ▪ Adaptation actions the City of Nelson has taken so far, including transitioning emergency planning responsibilities to the municipality and completing a Hazard, Risk, and Vulnerability Assessment in 2019. ○ *Wildfire* ▪ Effects of climate change so far on factors related to wildfire, including increasing numbers of high fire danger days and hazardous air quality occurrences. ▪ Adaptation actions that the City of Nelson has taken so far, including fuel management treatments and FireSmart initiatives.
City of Nelson Water Master Plan Update (2017)	This plan provides an update to the City of Nelson's Water Master Plan developed in 2007, summarizing infrastructure upgrades to date, and makes recommendations for the allocation of resources in the future. The plan includes a 'Source Evaluation,' an analysis which includes characteristics of source watersheds and associated risks to them. Water contamination from forest fire is identified as a 'loss of source scenario.' The Source Evaluation analysis also includes the effect of climate change on the watershed yield. Discussion of available fire flow is an additional component of this report. The report notes that there are some areas, including at the CPR track line near the airport, where available fire flow is less than the acceptable specifications in the City of Nelson zoning bylaw.
West Arm Provincial Park Fire Management Plan (2016)	This Fire Management Plan comprehensively analyzes social and environmental values at risk within West Arm Provincial Park, discusses the potential impacts to those values as a result of a wildfire burning through the park, and recommends management strategies and locations of fuel management treatments to mitigate the risk of adverse impacts.
Regional District of Central Kootenay Electoral Area E Community Wildfire Protection Plan - Update (2015) Electoral Area F	These documents are two Community Wildfire Protection Plans for two electoral areas within the Regional District of Central Kootenay. They 'update' the original 2008 Community Wildfire Protection Plans. They provide strategic guidance and recommendations to mitigate wildfire risk within these regions and include proposed treatment units where vegetation management might occur.

Plan	Description and Relationship to CWRP
Community Wildfire Protection Plan – Update (2015)	

2.6 LINKAGES TO HIGHER LEVEL PLANS AND LEGISLATION

Land use objectives, ministerial orders, and non-legal planning objectives outlined in Table 6 below should be reviewed, considered, and addressed during the fuel management prescription phase.

Table 6: Higher Level Plans and Relevant Legislation

Plan/Legislation	Description and Relationship to CWRP
FRPA – Government Action Regulations (GARs)	Old Growth Management Area (non-legal). • *2 non-legal OGMA located adjacent to, but not overlapping, municipal boundaries.*
BC Provincial Open Burning Smoke Control Regulation	The Open Burning Smoke Control Regulation came into effect in September 2019 and governs open burning relating to land clearing, forestry operations and silviculture, wildlife habitat enhancement, and community wildfire risk reduction. • *The entire wildland-urban interface of Nelson is within a High Smoke Sensitivity Zone.* • *All proposed treatment units are within the High Smoke Sensitivity Zone.*
Kootenay Boundary Higher Level Plan	The Kootenay Boundary Land Use Plan Implementation Strategy was completed in 1997, and was discussed in the previous CWPP. Legal, spatially-defined objectives for 'Connectivity Corridors,' and 'Water Intakes Used for Human Consumption' apply within the AOI. A non-legal objective for fire-maintained ecosystem restoration also applies - however, this provision targets NDT4 ecosystems, which are not present in the AOI.
Selkirk Resource District Fire Management Plan	This plan was published in 2015 and was discussed in the previous CWPP. It identifies values within the plan area with the intent of using this information to make appropriate fire response decisions.

SECTION 3: COMMUNITY DESCRIPTION

Nelson is located at an elevation of approximately 520 m on the southern shore of the West Arm of Kootenay Lake, surrounded by the Selkirk Mountains. The total Study Area that makes up Nelson's CWRP is shown in Map 1.

Nelson is located within the traditional territories of the Sinixt, Ktunaxa, Sylix, and Secwepemc First Nations.

Nelson provides planning and services to safeguard the health, safety, and welfare of its citizens; to respond effectively to emergencies; and to recover as efficiently as possible. Fire protection and emergency management are provided by the Nelson Fire & Rescue Services. Nelson Hydro provides electricity. Nelson also provides land use planning, solid waste services, building and development permits, bylaw enforcement, and administration. Water and sewer are provided to all residents within Nelson's municipal boundary.

Table 7: Nelson Socio-Economic Statistics

Metric	Value	Data Source
Total Population	11,198	Census Canada, 2021
Population Density (people/km^2)	1504	Census Canada, 2021
Median Age (years)	42	Census Canada, 2021
Housing Units	4995 occupied private dwellings total 2530 single-detached house 280 semi-detached house	Census Canada, 2021
Median Home Value	$580,000	Census Canada, 2021
Unemployment Rate	9.5%	Census Canada, 2021
Employment Rate	61.5%	Census Canada, 2021

3.1 AREA OF INTEREST AND WILDLAND-URBAN INTERFACE

The area of interest for this CWRP is Nelson, as encompassed by its municipal boundary and the portion of the municipal boundary surrounding the Bonnington Dam (total area of 1,616 hectares). Within the

municipal boundary is the area where urban development borders forests and open green space: the *wildland-urban interface,* or "WUI."[4]

The WUI is broadly defined as any area where combustible forest fuel is found adjacent to homes, farm structures, or other outbuildings. This may occur at the *interface*, where developments and forest fuel meet at a well-defined boundary, or in *intermix* areas, where community development and forest fuels intermingle with no clearly defined boundary.

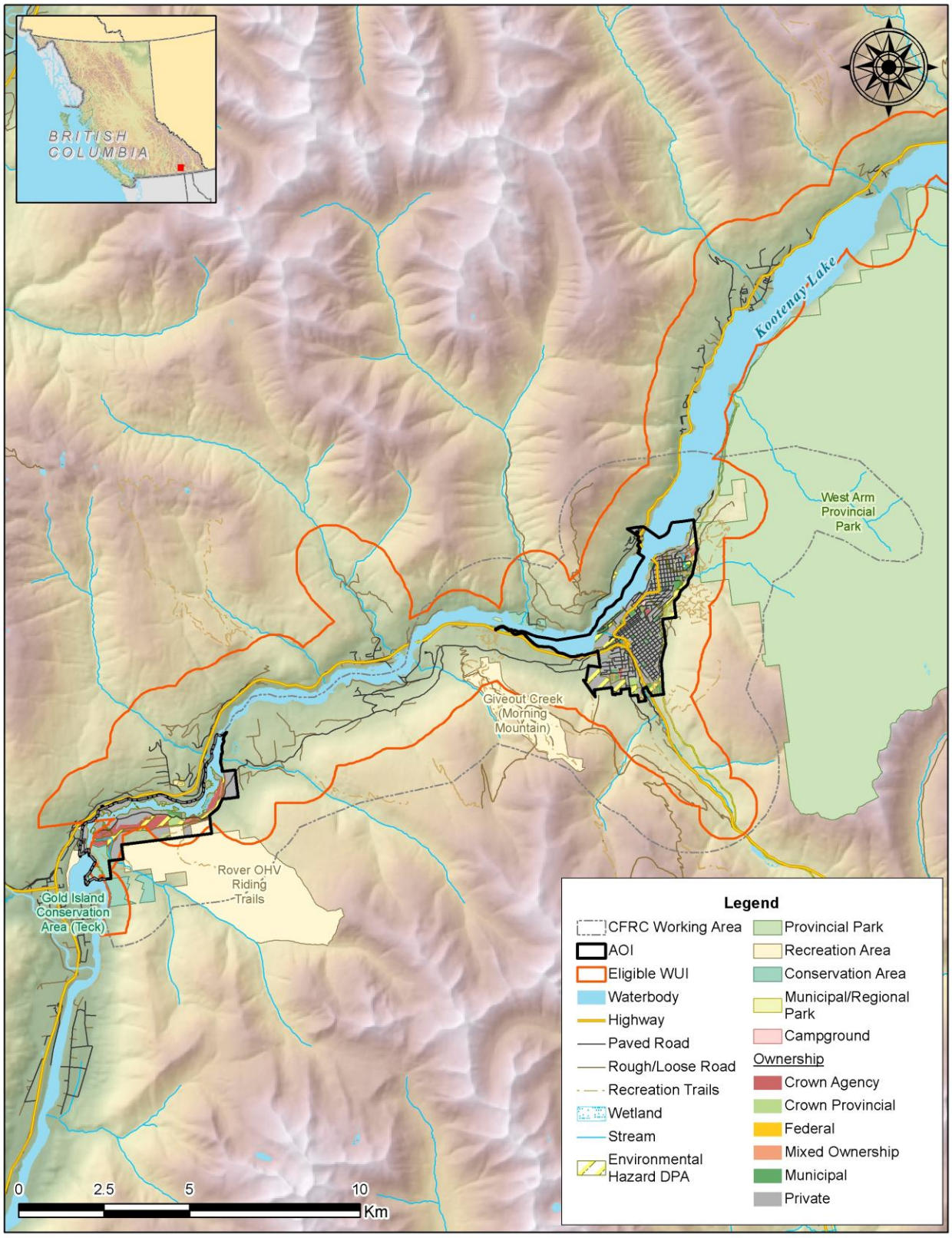
This CWRP uses a particular definition of the WUI, taken from the FireSmart Community Funding & Supports program guidelines. The definition of the WUI for the purposes of this CWRP is areas with a density of more than six structures per square kilometer, within 1 km of the area of interest. The FireSmart Community Funding & Supports terms this area the *Eligible WUI*, and communities can obtain funding to complete community wildfire resiliency projects within it.[5] Map 1 shows the area of interest (municipal boundary), Eligible WUI boundary, and land ownership types.

The Area of Interest and Eligible WUI are situated in the Selkirk Resource District and the South East Fire Region. Most of the land in the AOI is identified either as Crown Provincial (approximately 9%) or private ownership (56%). Municipal land encompasses 6% of the AOI. Portions of area identified as Crown Provincial are part of both West Arm Provincial Park, and Anderson Creek Timber, a Private Managed Forest.

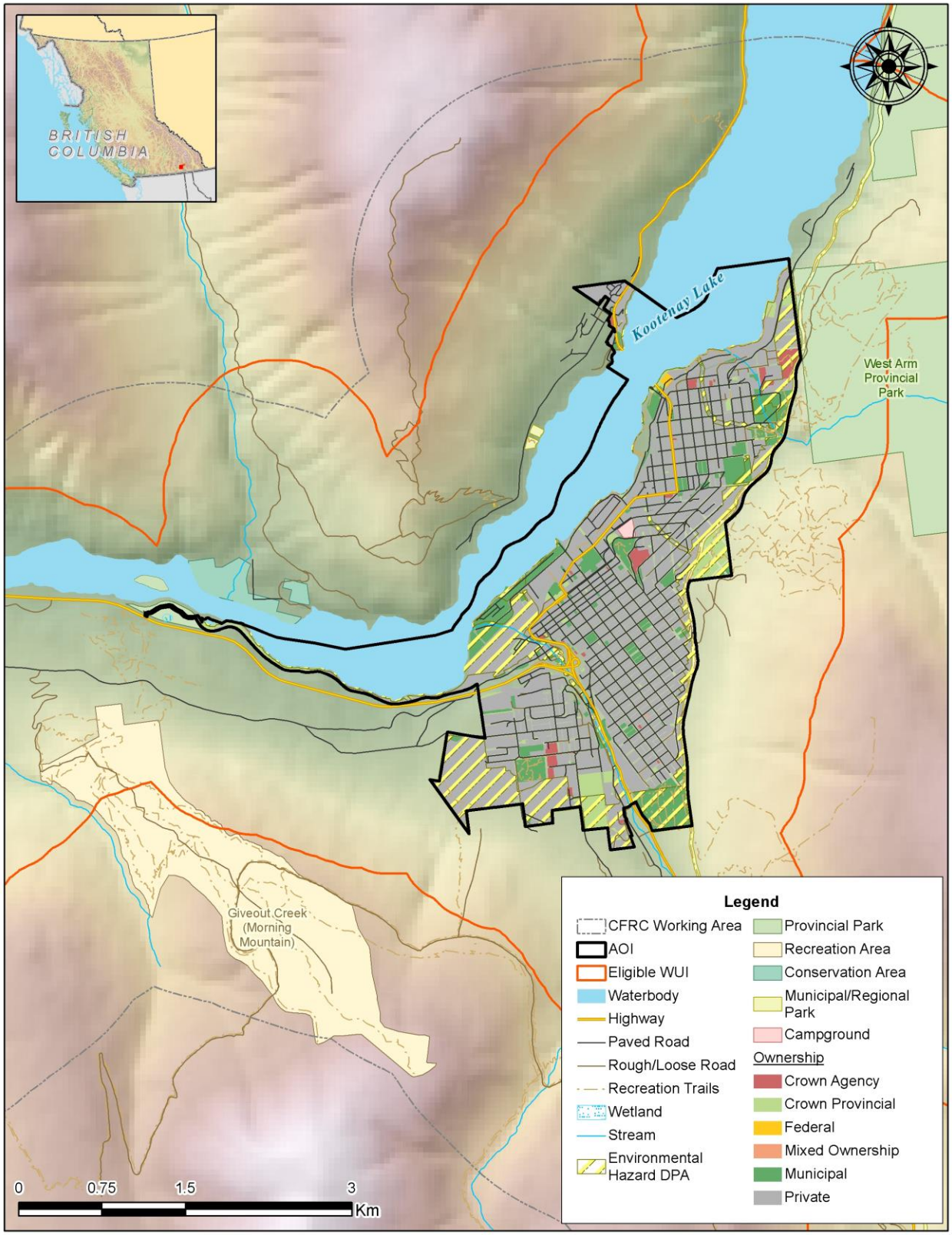
Table 8: Land ownership within the AOI.

Land Ownership	Area (Ha)	Percent of AOI (%)
Crown Agency	156	10%
Crown Provincial	138	9%
Federal	1	<1%
Mixed Ownership	<1	<1%
Municipal	97	6%
Private	885	56%
Unclassified	31	2%
Waterbody	267	17%

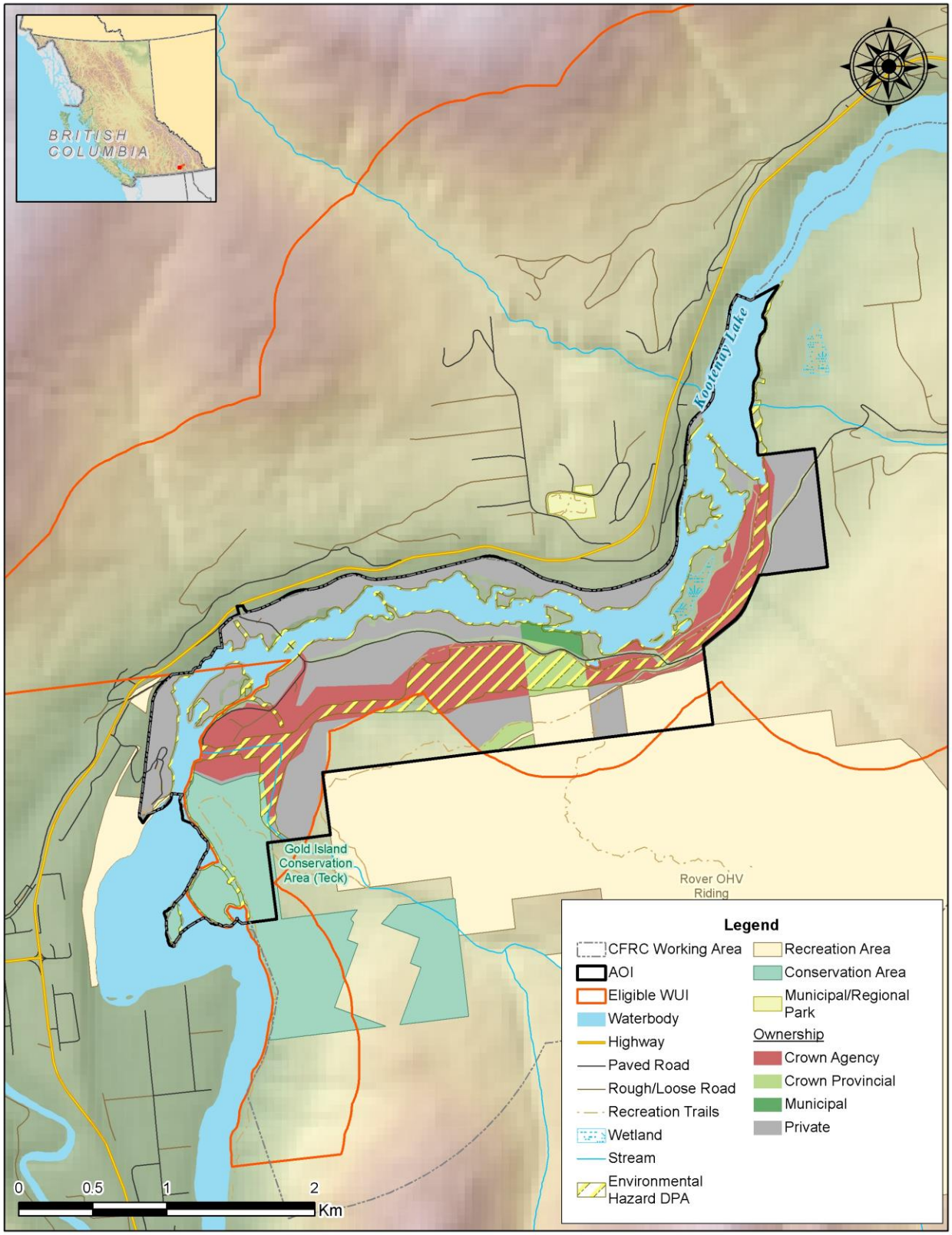
[4] British Columbia Wildfire Service. (2021). *Wildfire Glossary.* Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary
[5] Per 2021 Community Wildfire Resiliency Plan program and Instruction Guide.



Map 1: Nelson CWRP AOI and Eligible WUI – overview



Map 2. Nelson CWRP AOI and Eligible WUI – eastern area



Map 3. Nelson CWRP AOI and Eligible WUI – western area

3.2 COMMUNITY INFORMATION

Protection of critical infrastructure and values at risk during a wildfire event is an important consideration for emergency response effectiveness, ensuring that coordinated evacuation can occur if necessary and that essential services can be maintained or restored quickly in an emergency.

Emergency Management BC defines critical infrastructure as assets that are essential for the functioning of government and society, namely, water, food, transportation, health, energy and utilities, safety, telecommunications and information technology, government, finance, and manufacturing.[6] Critical infrastructure is shown on

Map 4 and Table 9 details the inventory of critical infrastructure identified in the WUI. 'Community Assets' are also included because funding is available through the UBCM CRI grant program to assess these structures. Cultural, environmental, and other resource values are also addressed and displayed on Map 5.

This section identifies and describes key critical infrastructure and values-at-risk across several different categories. Review and analysis of these values-at-risk was used in the development of recommendations in Section 5: FireSmart Principles.

Table 9: Critical Infrastructure within the WUI

Address	Latitude	Longitude	Name
Communications			
96 Baker St	49.48937	-117.30061	CDE Ventures Ltd. radio / cell tower
Community Assets			
502 Vernon St	49.4927	-117.29436	Nelson District Museum Archive & Art Gallery
675 Whitmore Rd	49.51449	-117.28642	North Shore Hall
801 Railway St	49.48763	-117.29704	Nelson Rod & Gun Club
329 Baker St	49.49123	-117.29644	Nelson Masonic Hall
717 Vernon St	49.49434	-117.29118	Nelson Senior Citizen's Association
310 Cedar St	49.49529	-117.28989	Boy Scout & Girl Guide Hall
402 Victoria St	49.49066	-117.29433	Royal Canadian Legion
608 Lake St	49.4942	-117.29348	Nelson & District Youth Centre
305 Hall St	49.49462	-117.29238	Nelson Recreation Complex
302 Cedar St	49.49567	-117.29021	Nelson Curling Club
402 Anderson St	49.49981	-117.27927	Heritage Building
306 Cedar St	49.49525	-117.29019	Nelson Youth Soccer Association
Education			

[6] Government of British Columbia. (2016). *British Columbia Emergency Management System*. Retrieved from: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/bcems/bcems_guide_2016_final_fillable.pdf

570 Johnstone Rd	49.51126	-117.28956	School District No. 8 Office
3648 Silver King Ski Hill Rd	49.46054	-117.28507	Nelson Area Waldorf School
2001 Silver King Rd	49.47696	-117.29594	Selkirk College
1605 Crease Ave	49.48065	-117.30277	Rosemont Elementary School
1623 Falls St	49.48158	-117.28998	The School House (early childhood care & learning)
1201 Josephine St	49.48702	-117.28758	Trafalgar Middle School
523 Mill St	49.48947	-117.29036	St Joseph School
814 Latimer St	49.48971	-117.28596	South Nelson Elementary School
606 Victoria St	49.49176	-117.29146	Kootenay School of the Arts
310 Nelson Ave	49.50038	-117.27921	Hume Elementary School
1004 Cottonwood St	49.50208	-117.27213	LV Rogers Secondary School
1102 Davies St	49.50327	-117.27115	Kootenay Kids (early childhood care & learning)
820 Tenth St	49.50662	-117.2687	Selkirk College
90 Lakeside Dr	49.49159	-117.30278	School District No. 8 Works Yard
Emergency Services			
820 Nelson Ave	49.50615	-117.27911	Nelson Ambulance Station
1010 Second St	49.50903	-117.27907	RCMP
606 Stanley St	49.49039	-117.29489	Nelson Police Department
919 Ward St	49.48845	-117.29062	Nelson Fire & Rescue Station
333 Victoria St	49.49061	-117.2953	Emergency Operations Centre
310 Ward St	49.49264	-117.29609	Emergency Operations Centre
Government Services			
202 Lakeside Dr	49.49327	-117.30046	Regional District of Central Kootenay Office
310 Ward St	49.49322	-117.29533	Service BC Centre
320 Ward St	49.49303	-117.29517	Nelson Provincial Court
602 Stanley St	49.49049	-117.29482	Nelson Public Library
403 Vernon St	49.49251	-117.296	Land Registry Office
Health Care			
818 Vernon St	49.4946	-117.28933	Group Home (Interior Health Authority)
3 View St	49.49444	-117.28536	Kootenay Lake Hospital
302 Anderson St	49.49982	-117.28095	Anderson Gardens (assisted living)
1020 Seventh St	49.50969	-117.27165	Lake View Village (assisted living)
500 West Beasley St	49.47917	-117.29865	Nelson Jubilee Manor (assisted living)
908 Eleventh St	49.50811	-117.26674	Mountain Lakes Seniors Living (assisted living)
Public Works & Environmental			
205 Lakeside Dr	49.49274	-117.29951	Nelson Ready Mix (Concrete Mixing Plant)
80 Lakeside Dr	49.49098	-117.30413	City of Nelson Works Yard
110 Cedar St	49.49706	-117.29148	Yellowhead Road & Bridge Works Yard
70 Lakeside Dr	49.49037	-117.30646	Nelson Recycling Depot
Transportation			
91 Lakeside Dr	49.49164	-117.30331	Nelson Airport (CZNL)
99 Lakeside Dr	49.49229	-117.30201	Canadian Helicopters Ltd.

20 Hall St	49.49673	-117.29532	Marine facilities
57 Government Rd	49.48769	-117.30129	Cutwater Holdings Ltd. (petroleum bulk plants)
95 Baker St	49.49004	-117.30135	Canadian Pacific Railway (rail yard)
Utilities			
3027 Silver King Rd	49.46774	-117.29008	FortisBC Utility
Silver King Rd	49.46846	-117.29142	FortisBC Utility
712 Wasson St	49.48434	-117.30289	FortisBC Utility
820 Behnsen St	49.50099	-117.2743	Nelson Hydro Utility
319 Sixth St	49.50089	-117.27417	Nelson Hydro Utility
1201 Mill St	49.49265	-117.28181	Nelson Hydro Utility
2201 Choquette Ave	49.47538	-117.30339	Water distribution infrastructure
1000 Robson St	49.48838	-117.2814	Water distribution infrastructure

3.2.1 EMERGENCY RESPONSE, PUBLIC SERVICES, AND COMMUNICATIONS

Structures that support the delivery of emergency response services, emergency social services, and communications in the event of an emergency have the potential to be impacted by wildfire. At the same time, these services and functions may be required to respond effectively to a wildfire incident. In case of an emergency such as an interface wildfire, the *Emergency Program Bylaw No. 3431, 2018,* authorizes the municipality to declare a State of Emergency and activate the Emergency Operations Centre. The Emergency Operations Center location is identified in Table 9.

Nelson is located within the Interior Health Authority. Kootenay Lake Hospital is within the Nelson boundary. There is one assisted living facility, three long-term care homes plus additional private services. These facilities have not been identified as critical infrastructure, but consideration for the needs of residents or service users of them is important for important emergency planning, response, and recovery initiatives.

Several cellular communication and radio towers are owned and operated by different providers within the municipality and the WUI. The cell tower located at the top of Mountain Station Road is of note due to the location at the edge of the WUI. Another telecommunications structure is listed as critical infrastructure in Table 9. This structure is located in the centre of the town in a non-fuel area.

3.2.2 ELECTRICAL POWER

A large fire has the potential to disrupt electrical service distribution through direct or indirect processes. For example, heat from flames or fallen trees associated with a fire event may cause power outages. Neighbourhoods with small, street-side wooden poles that connect to homes are particularly vulnerable to fire. As a result, secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks. Vulnerabilities for secondary power sources include mechanical failure; potentially insufficient power sources, should a wide-scale outage occur; and fuel shortage in the event of long outages.

There is a significant network of electrical power infrastructure that extends throughout the Nelson WUI. This infrastructure is owned and operated by Nelson Hydro, Fortis BC, Columbia Power, and BC Hydro, and is of local and regional importance. These utilities provide primary sources of power for the residents of Nelson and connect to other electrical infrastructure throughout the region. This system is well-mapped, and in the event of a wildfire these utilities will work with local and provincial emergency responders.

Electrical infrastructure in the Nelson WUI includes:

- High-voltage transmission lines;
- Overhead primary distribution lines; and
- Natural gas distribution infrastructure.

3.2.3 WATER AND SEWAGE

The functionality of critical water and sewage infrastructure can be impacted by an interface wildfire event as a result of emergency power cuts or physical damage. Infrastructure may be located in forested or interface areas near water sources, which increases their vulnerability.

Water and sewage services within the municipality are provided by Nelson through a network of pump and lift stations and reservoirs. Water is sourced from the Five Mile, Anderson Creek, and Mountain Station reservoirs. Pump and lift stations that have been identified as critical infrastructure are listed in Table 9. Overall, systems are well maintained with effective pressures in most areas. Nelson Fire & Rescue reports constraints to water supply only on the North Shore. Nelson Fire & Rescue has response capacity for these areas with the use of a water tender, which can shuttle from hydrants, if required. Water availability was recently reviewed in a study commissioned by the fire department.

3.2.4 HAZARDOUS VALUES

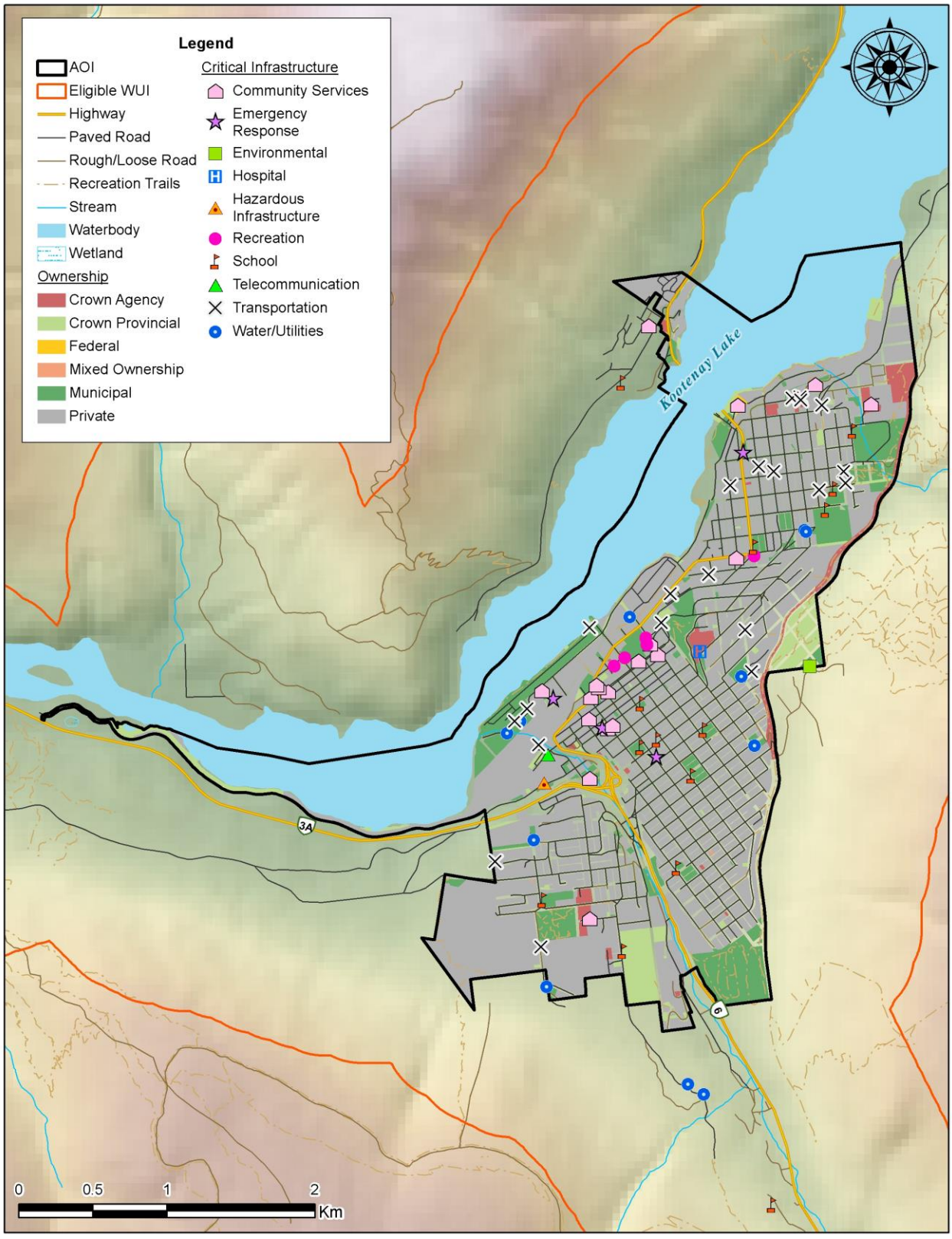
Hazardous values are defined as values that pose a safety hazard to emergency responders, and protecting hazardous values from fires is important to preventing interface fire disasters. Anywhere combustible materials, explosive chemicals, gas, or oil is stored can be considered a hazardous value.

Fortis BC has underground natural gas pipelines that run throughout Nelson supplying natural gas throughout the municipality. In the event of a wildfire, FortisBC will work with local and provincial emergency responders and employ their own emergency response protocols, including shutting down compressor stations, if required.[7]

[7] FortisBC. *Wildfires and evacuations.* Retrieved from: https://www.fortisbc.com/safety-outages/preparing-for-emergencies/wildfires-and-evacuations

Refuse for the Nelson is collected at the Nelson / RDCK Transfer Station and the Nelson Leaf's Bottle Depot. Hazardous materials are accepted for controlled recycling at this centre, including propane tanks, gasoline, vehicle batteries, oil filters, solvents, tires, large appliances, and other items.

Rail lines for both Canadian Pacific and Canadian National Railway run through Nelson, with a large railyard located in the center of town. Rail companies have emergency response plans and trained response staff.



Map 4: Critical infrastructure within the Eligible WUI.

3.2.5 HIGH ENVIRONMENTAL VALUES

The Kootenay Lake watershed overlaps the northern edge of the WUI and is an area of high environmental value. Water quality is an ecosystem service this area provides that is of critical value to residents throughout the region. The watershed also provides habitat for plant and wildlife communities. Species at risk and their habitat also occur within the watershed. Disturbance to forest stands, as a result of wildfire, has the potential to impact these values.

In the *Source Water Protection Plan*[8] for Nelson, wildfire was identified as a risk to drinking water quality, with potential impacts that may result from:

- Changes in watershed hydrology associated with forest health changes;
- Sedimentation and hydrology effects associated with wildfire and with wildfire fighting efforts; and
- Potential loss of control / access or damage at the intake due to wildfire.

West Arm Provincial Park is located close to the municipality, and overlaps some of the critical infrastructure that provides the city with drinking water. Biodiversity values within the park include old-growth forests and rare and endangered species and ecological communities, including whitebark pine, mountain caribou, grizzly bear, and fish species.[9]

Table 10 below lists the ecosystem or species at risk occurrences that have been identified through the B.C. Conservation Data Center (CDC) and have been specifically observed and recorded within the WUI boundary. Through consultation with the CDC and a biologist or qualified professional, all site level operational plans must identify and mitigate potential impacts to ecosystems or species at risk. Blue- and Red-listed occurrences are shown below on Map 5.

Table 10. Publicly available occurrences of Red and Blue-listed species recorded in the WUI.

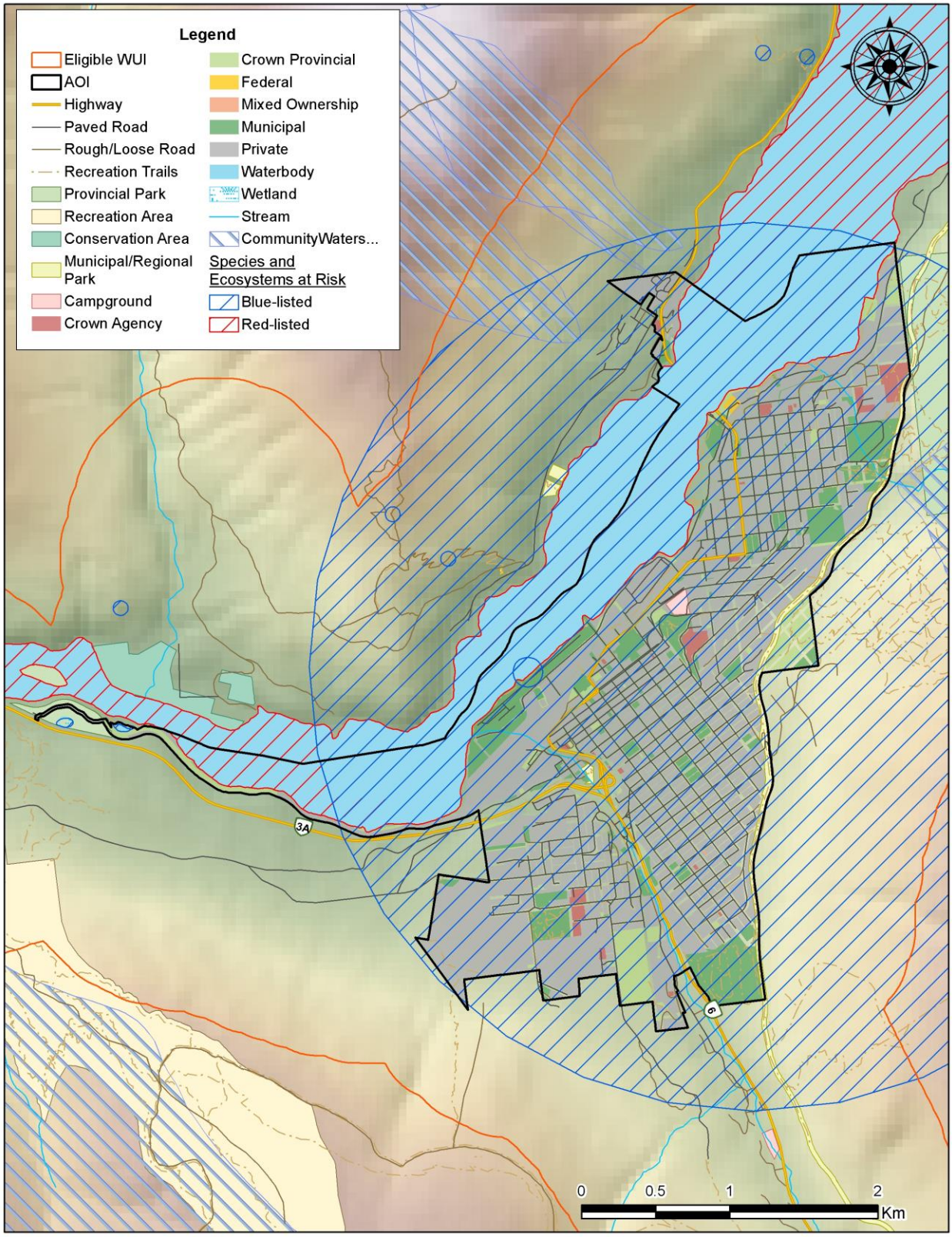
Common Name	Scientific Name	Category	BC List	Habitat Type
Western Screech-owl, Macfarlanei Subspecies	*Megascops kennicottii macfarlanei*	Vertebrate Animal	Blue	Terrestrial: Urban
Columbia Sculpin	*Cottus hubbsi*	Vertebrate Animal	Blue	Lacustrine: Shallow Water
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	Vertebrate Animal	Blue	Palustrine: Herbaceous Wetland
White Sturgeon (Upper Kootenay River Population)	*Acipenser transmontanus pop. 1*	Vertebrate Animal	Red	Riverine: Big River; Moderate Gradient; Low Gradient; Pool; Lacustrine: Deep Water

[8] *City of Nelson.* Source Water Protection Plan. (2021).
[9] BC Parks. (2016). *West Arm Provincial Park Fire Management Plan.*

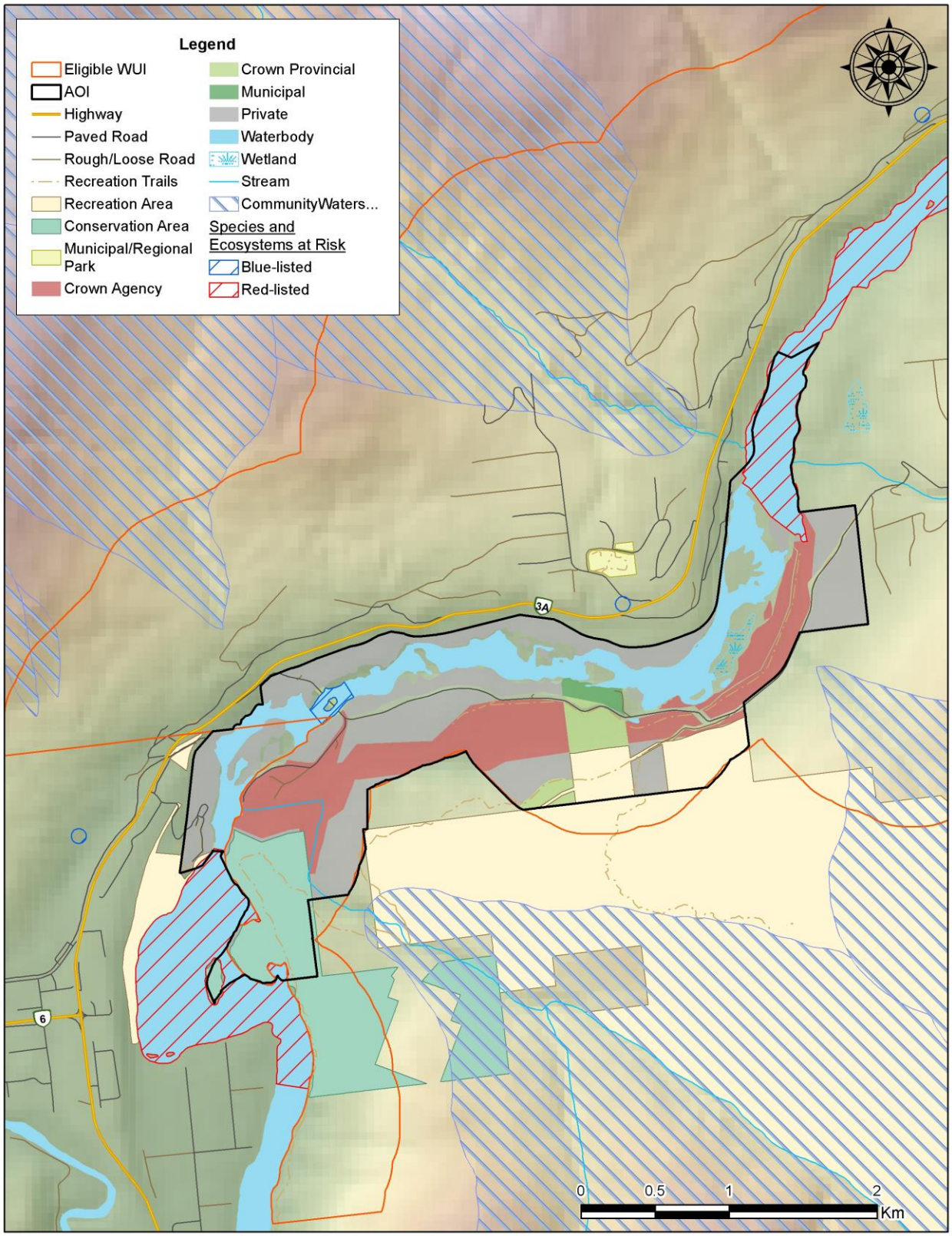
Umatilla Dace	*Rhinichthys umatilla*	Vertebrate Animal	Red	Lacustrine: Shallow Water
Umatilla Dace	*Rhinichthys umatilla*	Vertebrate Animal	Red	Riverine: Big River, Moderate Gradient
Monardella	*Monardella odoratissima ssp. discolor*	Vascular Plant	Unknown	Terrestrial

3.2.6 OTHER RESOURCE VALUES

A significant component of the local and regional economy is represented by tourism and outdoor recreation. West Arm Provincial Park and the surrounding forests encompass a network of trails that see significant use by hikers, mountain bikers, dog-walkers, and other recreational traffic, including on private managed forest land areas northwest of the town. Additionally, forestry activities occur outside municipal boundaries, including in the Harrop-Procter Community Forest adjacent to the West Arm Provincial Park. Several private companies operate hydroelectric facilities in the Bonnington Dam area, both overlapping and adjacent to municipal lands.



Map 5: Environmental and other resource values overlapping the eastern area of the AOI and Eligible WUI.



Map 6. Environmental and other resource values overlapping the western area of the AOI and Eligible WUI.

3.2.7 CULTURAL VALUES

Cultural values have the potential to be impacted by wildfire through physical damage or alteration. Wildfire suppression techniques have the potential to disturb unidentified archaeological sites. If cultural values are inventoried and identified as sensitive sites, the possibility of protection and accommodation of these features in a wildfire incident is increased.

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

There is the potential for previously unidentified archaeological sites to exist within the WUI. Prior to stand modification for fire hazard reduction, and depending on treatment location, preliminary reconnaissance surveys and/or archaeological impact assessments may be required to ensure that cultural heritage features are not inadvertently damaged or destroyed. Fuel treatment activities must include consultation with all identified First Nations at the site level and with sufficient time for review and input regarding their rights and interests prior to prescription finalization or implementation.

SECTION 4: WILDFIRE RISK ASSESSMENT

This section summarizes the factors that contribute to local wildfire risk in the Nelson WUI. The wildfire risk assessment provides a decision support tool to determine the most effective wildfire risk reduction actions and opportunities to increase community resilience.

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

Wildfire Risk = Consequence × Probability

Where:

Wildfire risk is the potential losses incurred to human life, property, and critical infrastructure within a community in the event of a wildfire.

Consequences are the repercussions associated with fire occurrence in an area (higher consequences are associated with densely populated areas, areas of high biodiversity, etc.).

Probability is the likelihood of fire occurring in an area and that area's ability to ignite, spread, and consume organic material in the forest – its *wildfire threat*. Wildfire threat is driven by three major components of the wildfire environment:

- Fuel - loading, size and shape, arrangement (horizontal and vertical), compactness, chemical properties, and fuel moisture.
- Weather – temperature, relative humidity, wind speed and direction, and rainfall.
- Topography - slope (increases / decreases rate of spread) and aspect (fuel dryness).

4.1 WILDFIRE ENVIRONMENT

The ecological context of wildfire and the role of fire in the local ecosystem under both current and historical conditions is an important basis for understanding the current and future wildfire threat to a community.

4.1.1 WILDFIRE ENVIRONMENT

Fuel

Within the municipal boundaries of Nelson, which represents the study area for this CWRP, municipal and Crown land comprises an overall small proportion of ownership. Of that proportion, a significant percentage of the vegetation is comprised of shrubby deciduous areas and mixed conifer and deciduous forests, in addition to areas of mature conifer forest.

While much of municipal land is not characterized by high hazard forest fuels, the average growth rate of trees and shrubs and the quantity of biomass does present a risk factor. Nelson is located within productive forest ecosystems and trees, shrubs and grasses grow at high annual rates. This poses a challenge for maintenance on both residents' private properties; for Nelson, around critical infrastructure and community assets; and for private utility firms. Nelson Hydro's 2021 report highlights this issue as a key concern relating to right-of-way management. While assessing fuel characteristics of private land is outside the scope of this report, quantities of biomass were anecdotally noted as a risk factor on private land, as well. The compact nature of Nelson's neighborhoods compounds this risk factor for residents because where structures are densely situated and vegetation is abundant; spacing vegetation away from structures appropriately is more challenging; and accumulations of leaves, needles, and woody debris on roofs and gutters and around structures are more likely.

Additionally, while outside the study area for this CWRP, the continuous forest stands that surround the municipality are a crucial consideration for wildfire risk to the community. Instances of historic and recent abiotic and biotic disturbances have influenced stand health in forests within West Arm Provincial Park, Anderson Creek Timber private forest landholdings, and Crown land surrounding the southwest of Nelson, as well as the North Shore.

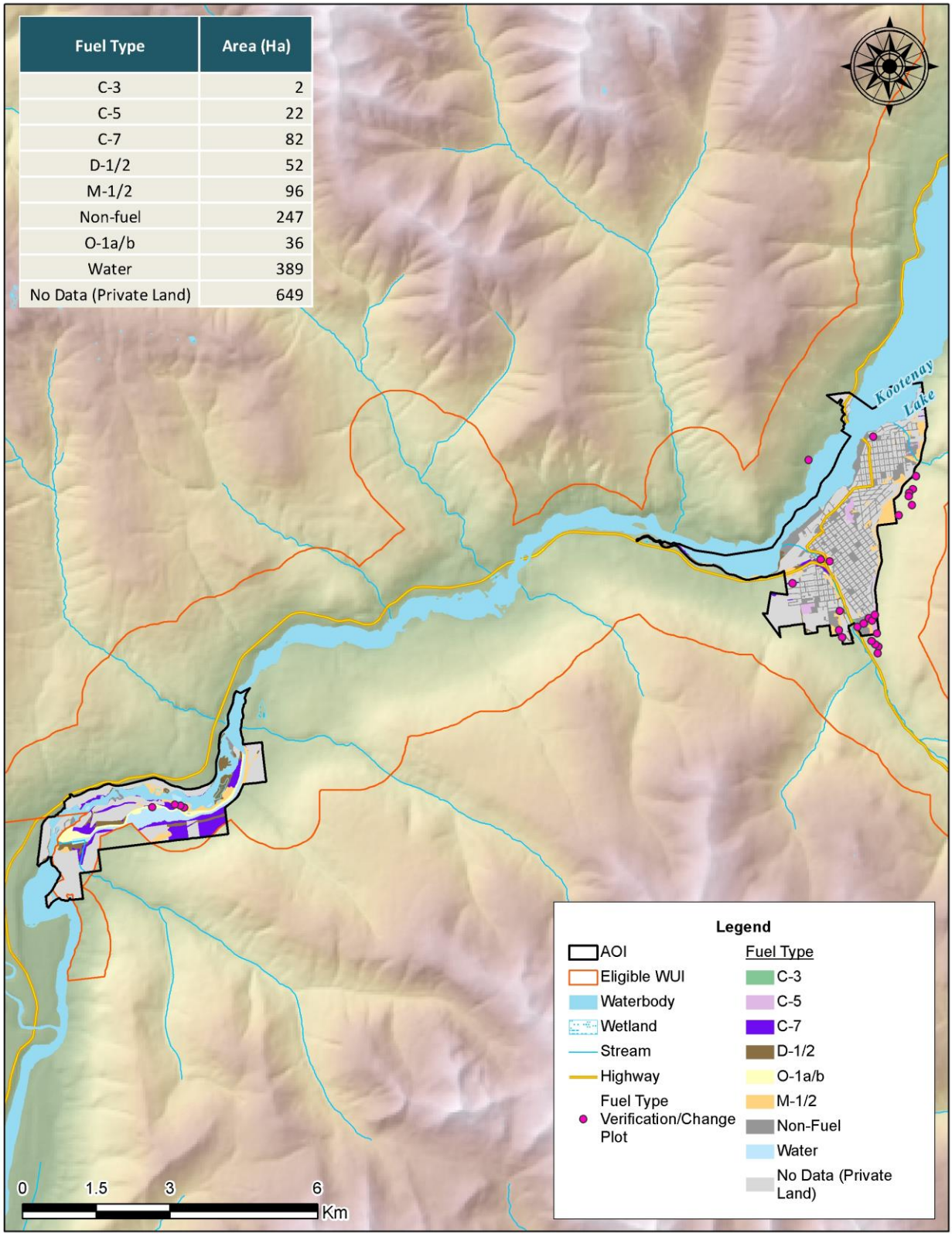
Bark beetles have had a prolific impact in all of these areas. As discussed in the 2008 and 2015 CWPPs and in the West Arm Fire Management Plan,[9] mountain pine beetle (*Dendroctonus ponderosae*) was a major disturbance agent in forests around Nelson. The West Arm Fire Management Plan reported that between 1987 and 2016, 11,658 ha of mountain pine beetle attack were recorded, with severe and very severe attacks accounting for most of the area affected. Most pine-dominated stands in the park were

affected, including areas around Nelson's drinking water infrastructure at Five Mile Creek. Mortality as a result of the mountain pine beetle outbreak in the early 2000's, as well as the presence of critical infrastructure for the community, was a major rationale for the fuel management work conducted in the park, which is discussed in Section 5.7.

The 2015 CWPP noted that mountain pine beetle activity was not increasing in the forests around Nelson. This statement remains accurate – the 2021 report *Overview of Forest Health Conditions in Southern British Columbia* reports static levels of mountain pine beetle activity in the Kootenay Lake TSA. However, the report also describes an increase in occurrences of Douglas-fir beetle (*Dendroctonus pseudotsugae)* in the area around Nelson, an observation which was corroborated by field work, especially the assessment conducted on Anderson Creek Timber land. These areas are being actively managed to mitigate the impacts of the beetle, but with the expectation that impacts will continue to occur and increase over the short-term.

The area and distribution of different forest and vegetation types has been recorded in a province-wide fuel type spatial data layer, maintained by BC Wildfire Service. This spatial data layer uses the Canadian Forest fire Behaviour Prediction System's fuel type classification, which details sixteen different forest and vegetation types and their characteristic fire behaviour under defined conditions.[10] Fuel type updates and corrections were made to the fuel type spatial data layer for this CWRP. Fuel type updates and corrections were also made to the fuel type layer for the 2015 CWPP and, as a result of this recent update, few changes were required. Overall, the fuel types identified and mapped in the 2015 CWPP are similar to the fuel types identified and mapped in this CWRP. Fuel types found within the municipality are shown on Map 7 below.

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



Map 7: Fuel types within the Eligible WUI.

Weather

The Biogeoclimatic Ecosystem Classification (BEC) system[11] is a provincial classification that divides the province into patterns of climatic envelopes, or zones. BEC zones are associated with unique climate attributes (relative precipitation and temperature) and Natural Disturbance Type regimes. Natural Disturbance Types are indicators of the frequency and severity of disturbance events. The predominant disturbance agent considered in the Natural Disturbance Type classification is fire, although other critical disturbance agents are factored into the system.

Table 11: BEC zones, subzones, and variants found within the WUI.

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
ICHdw1: Interior Cedar -- Hemlock, Dry Warm, West Kootenay variant	NDT3	1,575	100%

While the 2015 CWPP area of interest overlapped multiple different types of subzones and Natural Disturbance Types, the study area in this CWRP overlaps exclusively with the West Kootenay Dry Warm Interior Cedar Hemlock subzone variant. This is one of the largest subzones in the south-central Columbia Mountains. It is a drier subzone within the region, and is present at lower elevations and valley bottoms. It is characterized by milder winters, hotter summers, and less precipitation overall compared with other ecosystems in the Kootenays, and is associated with Natural Disturbance Type 3, which represents ecosystems with frequent stand-initiating events. These are forest ecosystems that experience frequent wildfires of various sizes, with the largest fires in the province often occurring in this NDT.

An important component of local weather that contributes to wildfire threat is the pattern of wind speed and timing observed throughout the fire season; wildfire that occurs upwind of a value poses a more significant threat to that value than one which occurs downwind. During most of the fire season (April – October), predominant daytime winds originate from the south, switching diurnally to northwesterly winds overnight. Winds are generally weaker in the winter and peak during the fire season. Westerly gusts along the lake of 45 to greater than 50 km / h have been recorded. Wind speed patterns were reviewed using data from the BC Wildfire Service, more details are presented in Appendix A-3: Fire Spread Patterns.

Fire danger class days are also used to describe the weather component of the wildfire environment. Fire danger class days were analyzed in the 2015 CWPP and are presented again below. The general trends and patterns are the same and continue to support the assertion presented in the past CWPP iterations that for about three months of the year, in the summer, there is a significant risk of a wildfire event (July, August, September).

[11] BEC Web. (2022). Ministry of Forests. https://www.for.gov.bc.ca/hre/becweb/

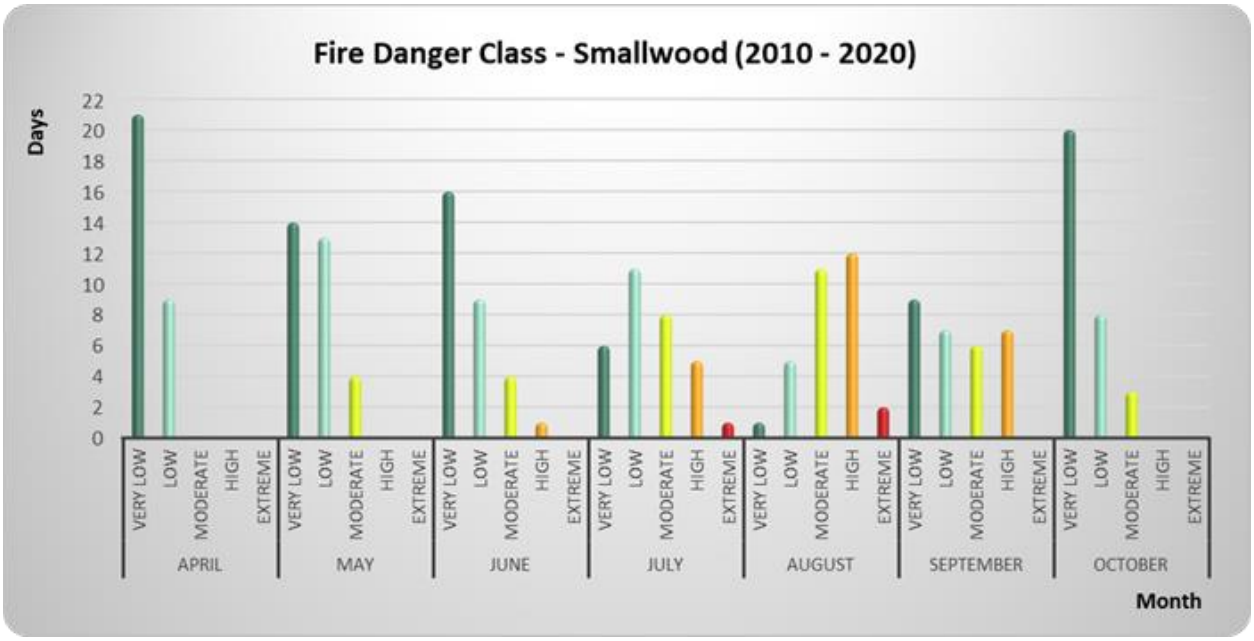


Figure 1: Average number of danger class days for the Smallwood fire weather station. Summary of fire weather data for the years 2010-2020.

Modelling for Canada and western North America predicts that climate warming is expected to increase the frequency of fires and increase fire severity trends that have already been identified in recent years.[12,13,14] Local climate projections[15] forecast the following:

- Average temperatures increasing 2.6-3.3°C, with summer temperatures warming faster than other seasons.
- Increasing numbers of 'high' or 'extreme' fire danger days each year.
- Hotter summers, with more extreme heat days (temperatures above 30°C) projected to increase from approximately 19 per year historically, to 43-52 days per year by the 2050s.
- Overall annual increase in precipitation, with significantly more precipitation falling in spring and fall, and less falling in summer compared with historic baselines.
- More days of heavy rainfall and fewer days of heavy snowfall.

[12] Running, S.W. (2006). *Is global warming causing more, larger wildfires?* Science. Vol 313, Issue 5789. https://science.sciencemag.org/content/313/5789/927/tab-figures-data

[13] Westerling, A., Hidalgo, H., Cayan, D., Swetnam, T. (2006). *Warming and earlier spring increase western U.S. forest wildfire activity*. Science. Vol 313, Issue 5789. https://science.sciencemag.org/content/313/5789/940

[14] Lemmen, D., Warren, F., Bush, E., editors. (2008). *From impacts to adaptation: Canada in a changing climate.* Government of Canada.

[15] Columbia Basin Rural Development Institute. (2020). *State of Climate Adaptation: City of Nelson.*

Topography

Slope percentage (steepness) influences a fire's trajectory and rate of spread, while slope position influences the ability of a fire to gain momentum uphill. Other factors of topography that influence fire behaviour include aspect, elevation, and configuration of features on the landscape that can either restrict the movement of a wildfire (i.e., water bodies, rock outcrops) or accelerate it (i.e., valleys, exposed ridges).

Table 12 shows the percent of the WUI by slope percent class and those classes' fire behavior implications. More than half of the area assessed is located on slopes <20% in gradient, which are not associated with an accelerated rate of spread. A smaller proportion of the AOI is located on slopes that are 21-30% in gradient, which is associated with an increased rate of spread. Little of the WUI is located on slopes that are associated with high to extreme rates of spread.

Table 12. Slope percentage and fire behaviour implications.

Slope	Percent of Eligible WUI	Fire Behaviour Implications
<20%	71%	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	14%	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	8%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	6%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	1%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

When slope percentage is considered in context with a value's slope position, that value's risk to increased fire behaviour can change dramatically – i.e., a value located in the upper third of a steep slope (>40%) will be exposed to fires downslope travelling very quickly uphill towards it. Table 13 summarizes the fire behaviour implications for slope position. A value located at the bottom of a slope is equivalent to a value on flat ground. A value on the upper third of the slope would be impacted by preheating and faster rates of spread. On the larger topographic scale, residential developments in the Nelson WUI are in the middle of continuous slopes, and on slope bottoms or valley bottoms. In select locations, neighborhoods are located at the upper third of slopes.

Table 13. Position of values on slopes and fire behaviour implications.

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).

Position of Value	Fire Behaviour Implications
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 third of slope	Impacted by extreme rates of spread. At risk to large continuous fire run, preheating and flames bathing into the fuel.

Wildfire History

The Nelson WUI lies within forest ecosystems which historically have been characterized by mixed-severity fire regimes. Localized data collection in the Nelson area has determined wide ranging fire return intervals, depending on burn severity. Low intensity burns historically recurred in less than 20-year intervals and that high-intensity burns historically recurred at approximately 200-year intervals around Nelson.[16] This is corroborated by field work completed for the West Arm Fire Management Plan, which found evidence for occurrences of both high- and low-severity burns in the park.

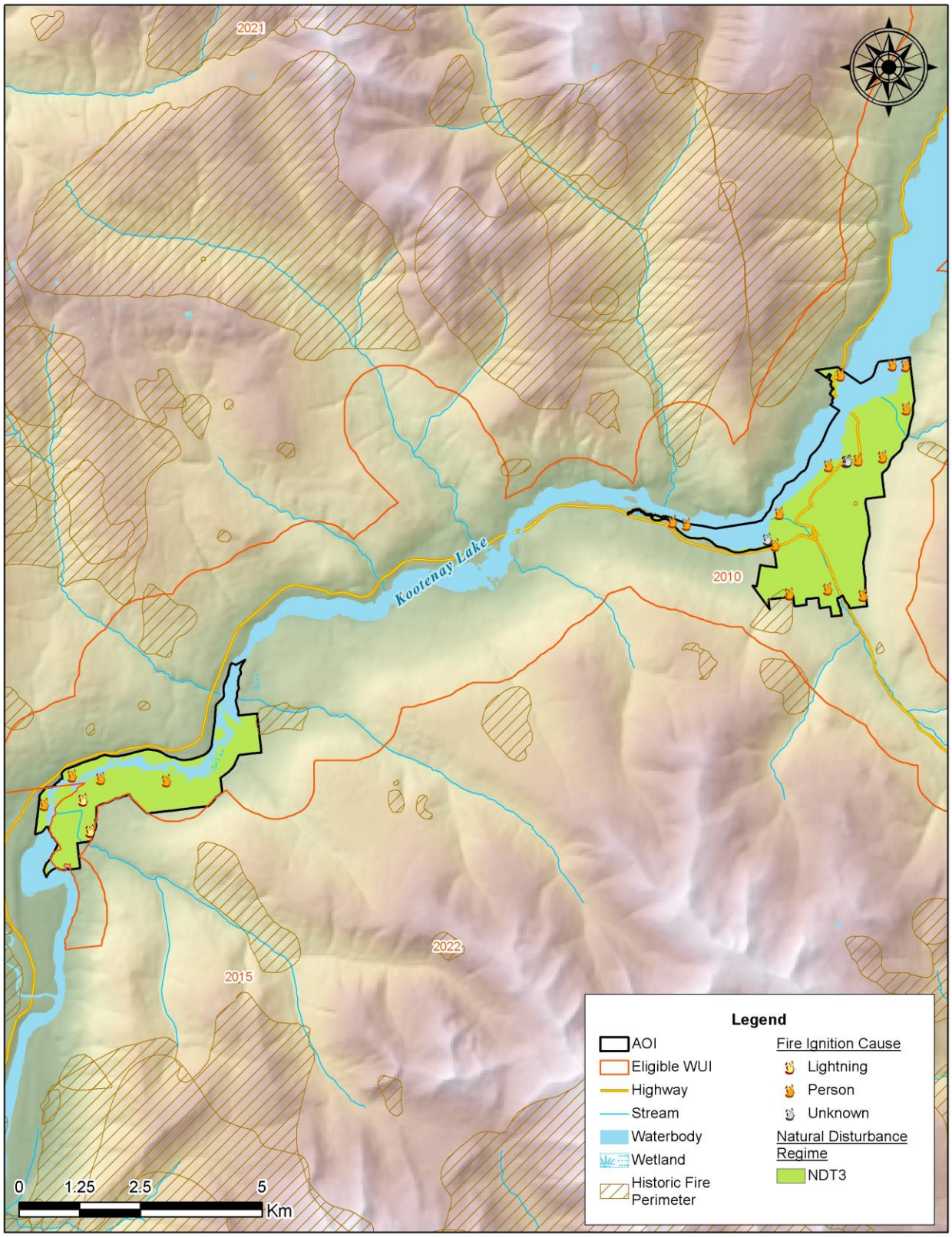
The 2020 *State of Climate Adaptation* report for Nelson included analysis of the area burned in the Kootenay Lake Fire Zone past 50 years. It did not find a statistically significant trend in annual area burned, but identified a pattern of severe fire seasons occurring roughly every 10 to 20 years.[17] It also identified a significant upward trend in the number of fires in the Southeast Fire Centre area that grew larger than one hectare in size and correlated that observation with reports of increasing fire season extremity as a result of climate change.

Historical fire ignition and perimeter data are depicted below in Map 8. Fire ignition data is available from 1950-2021 and fire perimeter data is available from 1919-2021 for the WUI. Historic fire ignitions are shown only within the Eligible WUI boundaries for Nelson, but historic fire perimeters are shown for the surrounding area. Within the last five years, three major fires have burned within 20 kilometers of municipal boundaries. Many more large fires burned historically (1950s and earlier), likely accidentally ignited during resource extraction works. Based on the BCWS historical fire ignition dataset, most historical ignitions with the WUI are human caused. A total of 1,888 ignitions have been recorded by BCWS within 10 kilometers of the municipal boundary since 1950 that have a known cause of ignition. Of that total, 33% were caused by lightning and 67% were caused by humans. Since 2015, when data was last assembled for the Community Wildfire Protection Plan, there have been 126 ignitions recorded by BCWS, within 10 kilometers of the municipal boundary.

Multiple significant wildfire seasons have occurred impacting the province and the West Kootenays since the last CWPP was written. The 2021 wildfire season was precipitated by an extreme heat dome event in late June, which followed a warm and dry spring. In the Southeast Fire Centre, 77, 615 hectares burned, including the Arrow Lake complex fire and eight other fires of note. Between 2015 and 2020,

[16] MacKillop, D.J. and Ehman, A.J. (2016). *A Field Guide to Ecosystem Classification for Southeast British Columbia: The South-Central Columbia Mountains.*
[17] City of Nelson (2020). *Nelson Next Climate Plan.*

two of the worst wildfire seasons in BC history occurred. Provincial fire suppression costs of the 2017 fire season exceeded $650 million, more than 65,000 people were evacuated, and over 1.2 million hectares of land burned. The area burned in 2017 was unfortunately surpassed the next season in 2018, when more than 1.3 million hectares burned. Record breaking temperatures and clusters of lightning strikes were major contributors to the severity of those seasons.



Map 8: Natural disturbance regimes and historical fire ignitions and occurrences within and adjacent to the Eligible WUI and AOI.

4.2 WILDFIRE THREAT ASSESSMENT

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

- *Fuel type attribute assessment* – ground truthing/verification and updating as required to develop a local fuel type map (Appendix A-1: Fuel Typing Methodology, Map 7).
- *Consideration of the proximity of fuel to the community* – recognizing that fuel closest to the community usually represents the highest hazard (Appendix A-4: Proximity of Fuel to the Community).
- *Analysis of predominant summer fire spread patterns* – using wind speed and wind direction during the peak burning period using ISI Rose(s) from BCWS weather station(s) (Appendix A-5: Fire Spread Patterns).
- *Consideration of topography in relation to values* – slope percentage influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill (4.1.1 Wildfire Environment – Topography).
- *Stratification of the WUI* – according to relative wildfire threat based on the above considerations, other local factors, and field assessment of priority wildfire risk areas (Appendix B: Wildfire Threat Assessment Plots – Worksheets and Photos).

Wildfire Threat Assessment plots were completed over a number of field days in July of 2022 in conjunction with verification of fuel types to support development of priority treatment areas and to confidently ascribe threat to polygons which may not have been visited or plotted, but which have similar fuel, topographic, and proximity to structure characteristics to those that were assessed.

Field assessment locations were prioritized based upon:

- *Proximity to values at risk*: Field assessments were clustered in the intermix and interface, as well as around critical infrastructure.
- *Prevailing fire season winds*: More field time was spent assessing areas upwind of values at risk, especially in potential locations for landscape-level fuel breaks.
- *Local knowledge*: Areas identified as hazardous, potentially hazardous, with limited access/egress, or otherwise of particular concern as vulnerable to wildfire, as communicated by local fire officials and community forest representatives.
- *Observations*: Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.
- *Verifying provincial classification*: Areas classified as high threat in the provincial PSTA dataset, or with an uncommon fuel type, were assessed to ground-truth the fuel type and threat, even if they were relatively far from values.

A total of 22 Wildfire Threat Assessment plots were completed and 200 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the WUI (see Appendix B: Wildfire Threat Assessment Plots – Worksheets and Photos and Map 9).

4.3 WILDFIRE BEHAVIOR THREAT CLASS ANALYSIS

Classes of the wildfire behaviour threat class analysis are as follows:

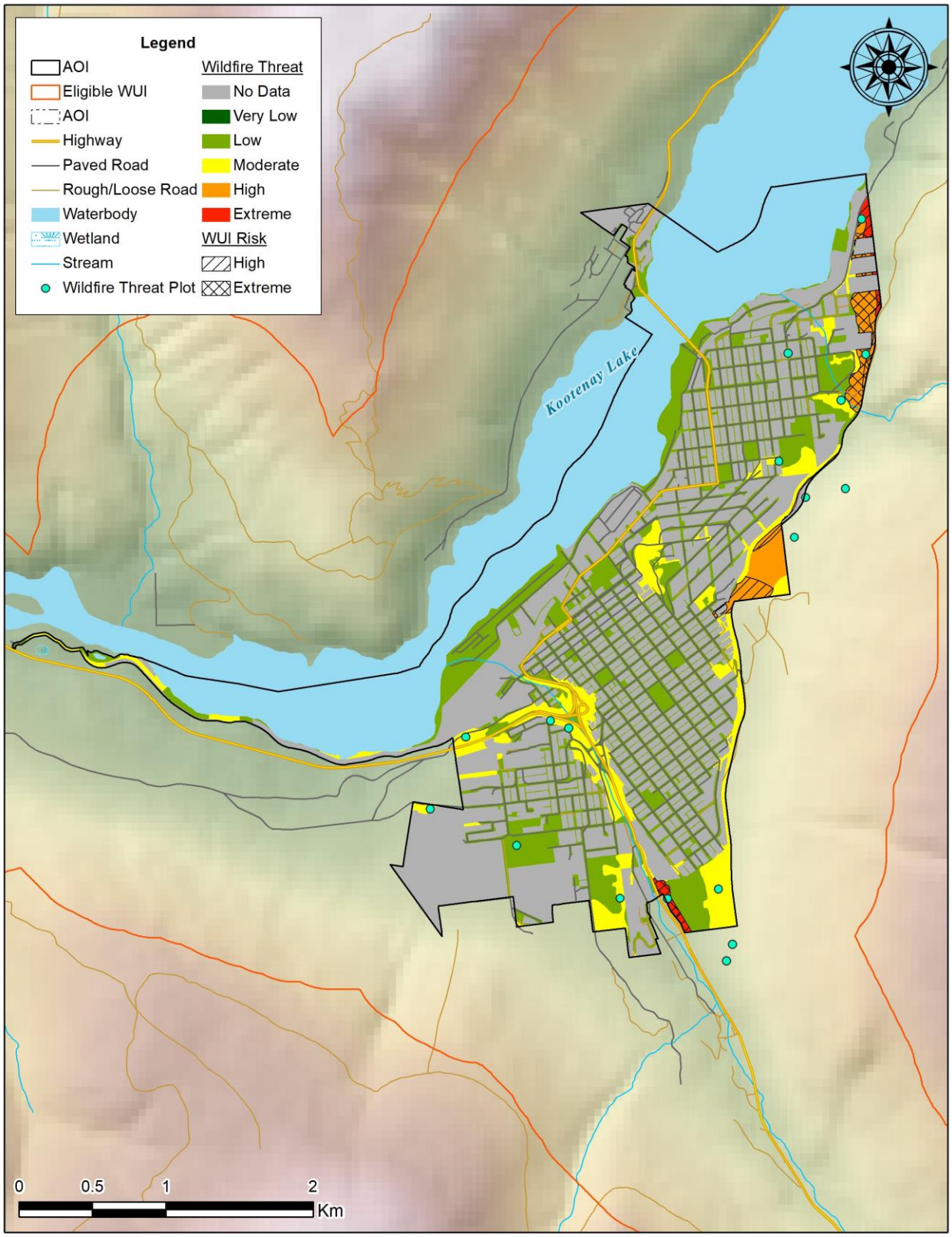
- Very Low: Waterbodies with no forest or grassland fuels, posing no wildfire threat.
- Low: Developed and undeveloped land that will not support significant wildfire spread.
- Moderate: Developed and undeveloped land that will support surface fires that are unthreatening to homes and structures.
- High: Landscapes or stands that are continuous forested fuels that will support candling, intermittent crown or continuous crown fires. These landscapes are often steeper slopes, rough or broken terrain, and/or south or west aspects. High polygons may include high indices of dead and downed conifers.
- Extreme: Continuous forested land that will support intermittent or continuous crown fires.

The results of the wildfire behaviour threat class analysis are shown on Map 9 and in Table 14 below. About 40% of the WUI is classified as private land and as such has not been allocated fire threat data. About 25% of the WUI is either water or very low threat. About 3% of the WUI is extreme and high threat. *The majority of the assessable public land in the WUI is rated as moderate or low threat.*

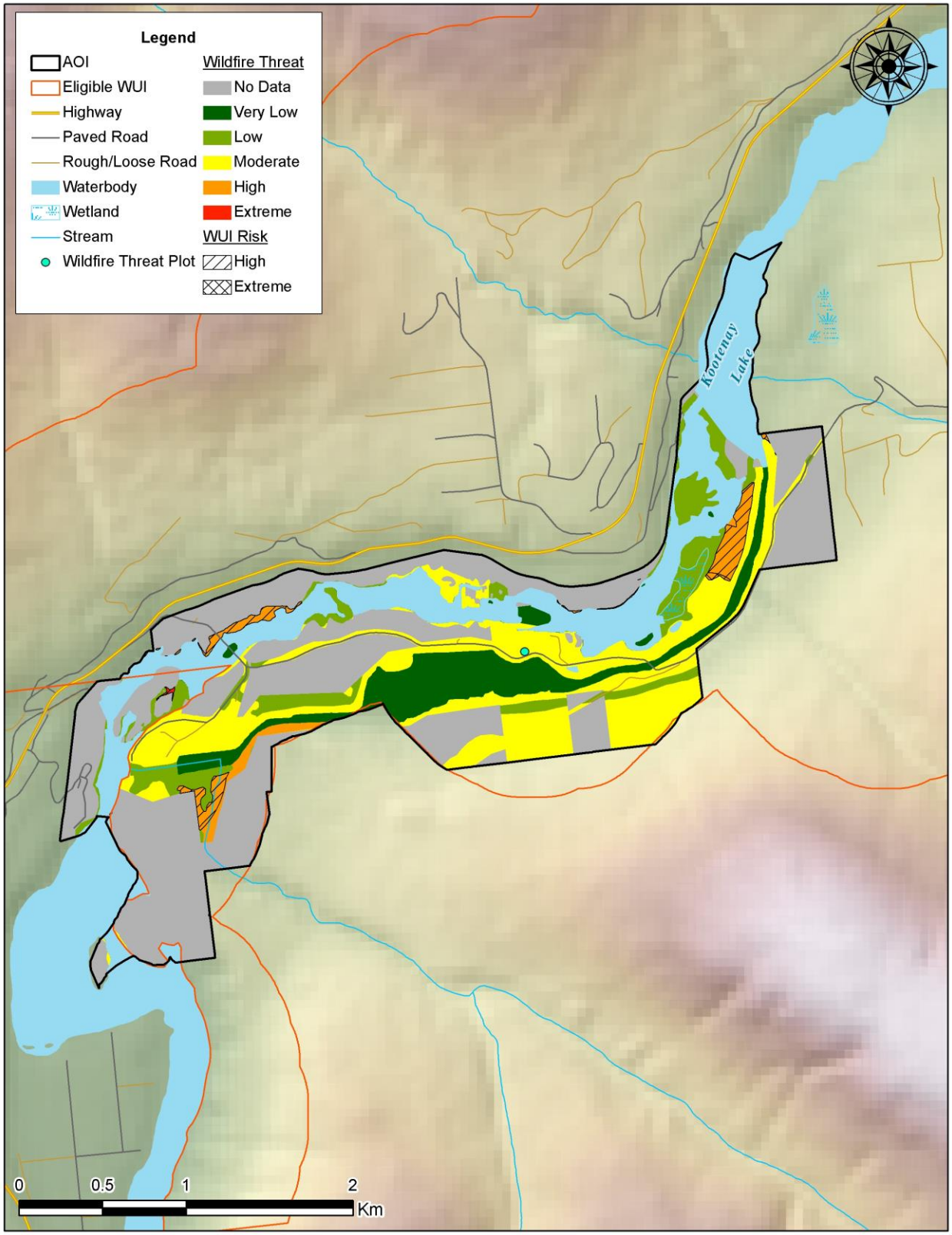
It should be noted the statistics resulting from this assessment differ significantly from the 2015 CWPP. This is primarily a result of the changes to the CWRP framework, which now emphasizes a local threat analysis that centers within the municipal boundaries. The fuel types that occur within the municipal boundaries are lower-risk, overall, than the fuel types that occur outside municipal boundaries. This is a primary driver of the lower risk rating of this CWRP. However, these results do not mean that Nelson is less influenced by wildfire threat from outside the municipal boundary. The importance of interagency cooperation, to share wildfire threat information between different agencies is therefore heightened. Section 5.4 reviews priority actions to related to this FireSmart discipline in detail.

Table 14: Fire behavior threat summary for the WUI.

Wildfire Threat			
Threat Class	**Hectares**	**Percentage (%) of WUI**	**Percentage (%) of Assessable Public Land**
Extreme	4	<1%	<1%
High	38	2%	4%
Moderate	191	12%	21%
Low	304	19%	33%
Very Low/No Threat (Water)	389	25%	42%
No Data (Private Land)	649	41%	-



Map 9: Local fire behaviour within the eastern area of the AOI.



Map 10 Local fire behaviour within the western area of the AOI.

4.3.1 WUI THREAT CLASS ANALYSIS

WUI Threat classes are quantified when the Wildfire Behaviour Threat is assessed as high or extreme, causing the potential of unacceptable wildfire threats when near communities and developments. WUI Threat Classes are described below:

- **Low**: The high or extreme threat is sufficiently distant from developments, having no direct impact on the community and is located over 2 kilometers from structures;
- **Moderate**: The high or extreme threat is sufficiently distant from developments, having no direct impact on the community and is located 500 meters to 2 kilometers in distance from structures;
- **High**: The high or extreme threat has the potential to directly impact a community or development and is located 200 meters to 500 meters from structures; and
- **Extreme**: The high or extreme threat has the potential to directly impact a community or development and is located within 200 meters from structures.

Table 15 below (and also displayed on Map 9) summarizes the WUI threat class ratings within Nelson's WUI. 10 hectares have an extreme threat class rating, 21 hectares have a high threat class rating, and 11 hectares have a moderate threat class rating.

Table 15: WUI threat class ratings. For detailed field data collection and spatial analysis methodology for the local threat assessment and classification, see Appendix B: Wildfire Threat Assessment Plots – Worksheets and Photos.

WUI Risk			
Threat Class	**Hectares**	**% of Entire WUI**	**% of Assessable Public Land**
Extreme	10	1%	1%
High	21	1%	2%
Moderate	11	1%	1%
N/A (Moderate, Low, Very Low Fire Behavior)	884	56%	95%
No Data (Private Land)	649	41%	70%

4.4 HAZARD, RISK, AND VULNERABILITY ASSESSMENT

The Hazard, Risk, and Vulnerability Analysis (HRVA) that local governments undertake as part of the legislative requirements to develop a local Emergency Management Plan may provide additional locally derived information about critical infrastructure important to the community.[18] Emergency Management BC supports this by providing the Critical Infrastructure Assessment Tool.[19]

The purpose of a HRVA is to help a community make risk-based choices to address vulnerabilities, mitigate hazards, and prepare for responding to and recovering from hazard events. The HRVA process assesses sources of potential harm, their likelihood of occurring, the severity of their possible impacts, and who or what is particularly exposed or vulnerable to these impacts.[20]

An updated Hazard, Risk, and Vulnerability Analysis is scheduled to be completed by Nelson in the next five years. This may provide a further refined inventory of critical infrastructure and values-at-risk within the municipality. In 2019, the first version of a comprehensive Hazard, Risk, and Vulnerability Assessment was completed after emergency planning responsibilities were shifted from the RDCK to Nelson. It is recommended that the information gathered from the Hazard, Risk, and Vulnerability Analysis be incorporated into a future CWRP update for Nelson and be utilized in the creation of any other related emergency response plans.

[18] UBCM. 2020. *Community Wildfire Resiliency Plan Instruction Guide*. Retrieved from: Community Wildfire Resiliency Plan Instruction Guide (ubcm.ca)
[19] More information on the instruction guide can be found here: https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/local-emergency-programs/critical-infrastructure-assessment.
[20] Government of BC. 2020. *HRVA Example Report.* https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/local-government/hrva/hrva_forms-step_8-anytown_bc-sample_hrva_report.pdf.

SECTION 5: FIRESMART PRINCIPLES

FireSmart® is the nationally accepted set of principles, practices, and programs for reducing losses from wildfire and is founded in standards published by the National Fire Protection Association.[21] FireSmart concepts, including recommended FireSmart guidelines,[22] have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000.

FireSmart includes seven disciplines, which provide a sound framework for reducing wildfire risk to communities:

- Education
- Legislation and Planning
- Development Considerations
- Interagency Cooperation
- Cross-Training
- Emergency Planning
- Vegetation Management

The overarching goal of FireSmart is to encourage communities and citizens to adopt practices to mitigate the negative impacts of wildfire to assets on public and private property.

The vulnerability of structures and homes to ignition, in particular their vulnerability to embers, is one of the most important wildfire hazards to address to reduce the potential of damage to neighborhoods and critical infrastructure as a result of a wildfire event. Therefore, while residents, industry, businesses, and governments all share responsibility for effectively mitigating wildfire hazard in communities, risk mitigation actions on private properties are emphasized.

5.1 EDUCATION

Nelson Fire & Rescue Services has led an established program of FireSmart and public education initiatives for several years. The *Nelson Next Climate Plan* (2020) reports approximately 1000 Home Ignition Zone assessments completed since 2005. The program has further increased in scope since the last CWPP was written in 2015, with larger projects being undertaken. In 2022, a FireSmart Coordinator position was created, increasing the resources available to direct resident engagement and participation in community events (e.g., farmers' markets).

Currently, FireSmart social media messaging is well established, with seasonally relevant content delivered through the Nelson Fire & Rescue's Facebook page, including information about wildfire

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

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

ignition hazards; campfire ban, water restriction, and fire danger rating changes; tips for FireSmart home maintenance; and other emergency preparedness information. Permanent pages located on Nelson's website, and publications and interviews in local media outlets also provide information on wildfire preparedness. In 2021, new resident engagement methods were tried, including the production of FireSmart animated videos and the delivery of a rebate program to support residents in undertaking FireSmart upgrades to their homes. The result of this engagement and public outreach has been well received, with positive uptake and interest from residents.

Education and FireSmart programming have historically not targeted individual neighborhoods, but instead offered initiatives that all homeowners are eligible to participate in. This reflects both the compact nature of development in the area, the vulnerability of structures throughout the town, and the importance and efficacy of all homeowners taking action to reduce risk on their property. In some cases, such as where there are strata lands, neighborhood level engagement may be more appropriate to address hazard beyond individual properties that is not on municipal land. For this reason, targeted neighborhood engagement is recommended in this CWRP.

FireSmart education work in Nelson has often been combined with other work Nelson has undertaken in order to increase community wildfire resiliency. For example, a 'Rail Trail Volunteer FireSmart Day' was held in the spring of 2022. This was a participatory FireSmart demonstration project that aimed both to achieve vegetation management goals and FireSmart education goals. Communicating the importance of FireSmart, and the work that has already been completed around Nelson, was an important component of this project. In addition, residents were provided with a hands-on learning experience to increase understanding of what FireSmart landscaping techniques entail. This proved to be a very popular public education format, with more registrants than slots to participate. The event was publicized in local media and signage was installed along the rail trail afterwards.

Additionally, two open house events have been held, in order to provide the public with information about wildfire risk and risk reduction activities in the different jurisdictions around the Nelson area. The event highlighted initiatives that Nelson, the Regional District of Central Kootenay, the Ministry of Forests, and BC Parks, have cooperated to implement. Fuel treatment work has been a primary focus of this partnership and is discussed further in Section 5.7. Finally, a mock evacuation exercise was conducted in the fall of 2022. This event combined emergency preparedness objectives with educational objectives, such as increasing awareness about how an evacuation would be directed, what the process might be like, and how households can prepare.

The recommendations that follow on the next page highlight opportunities for Nelson to build on the strengths of the existing, established program and suggest new areas to explore and apply additional resources to.

Table 16: Education recommendation and action items.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: provide information to communities and citizens empowering them to adopt and conduct FireSmart practices to mitigate the negative impacts of wildfire to their homes/businesses, properties, and neighbourhoods.							
1	Moderate	**This CWRP report and associated maps should be made publicly available on the City of Nelson website and social media.**	The CWRP may also be directly shared with local stakeholders who may be interested in collaborating on FireSmart and wildfire risk reduction activities.	City of Nelson (Communications or FireSmart Coordinator)	1 year	Available for download or viewing on the City's website.	Eligible for UBCM CRI funding.
2	High	**Continue to build up and conduct a FireSmart public education campaign within the municipality.**	Maintain and expand the strong level of resident engagement by continuing to host or participate in community events and info sessions. Consider hosting FireSmart workshops. Include education specific to Nelson, such as best practices for landscaping, preferred materials for use when conducting home renovations, and safe debris removal methods. Promote the use of the *FireSmart Begins at Home* app to allow residents to self-assess their home for wildfire risk, and/or provide contact information to request a home assessment by a Local FireSmart Representative. The public education campaign should build on modes of engagement that have been previously successful (e.g., farmers' market booths), and pilot new public outreach strategies as well (e.g., targeting specific demographics such as tourists or seasonal residents). A FireSmart public education campaign	City of Nelson (Communications, Emergency Management, Fire & Rescue, FireSmart Coordinator)	Ongoing	Ongoing events scheduled throughout the year.	Eligible for UBCM CRI funding.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
			should also emphasize the accomplishments of the Nelson FireSmart Committee to date.				
3	High	**Continue to fund a full-time FireSmart Coordinator position.**	A full-time FireSmart Coordinator position will provide the person hours necessary to administrate the public education campaign, as well as residential-scale vegetation management incentive activities. Furthermore, continued funding from UBCM CRI may become contingent on maintaining this staff position.	City of Nelson (Nelson Fire & Rescue)	Ongoing	FireSmart Coordinator remains on staff.	Eligible for UBCM CRI funding.
4	Low	**Engage with residents on strata land to promote the FireSmart Neighborhood Recognition Program.**	Strata land residents should be engaged specifically, in order to ensure that right-of-way and green space vegetation management is completed on areas that do not belong to the municipality. Consider engaging with neighborhood organizations or strata groups which Nelson Fire & Rescue already has a working relationship with. Review 'FireSmart Neighborhood Recommendations' for priority neighborhoods.	City of Nelson (Nelson Fire & Rescue, FireSmart Coordinator)	Ongoing	Engagement occurs with strata organizations.	Eligible for UBCM CRI funding.

5.2 LEGISLATION AND PLANNING

A summary of Nelson's current bylaws, policies, and plans relevant to wildfire risk and emergency planning was provided earlier in Section 2.4. Reviewing zoning bylaws through a wildfire lens to assess where they inadvertently promote conditions that may contribute to fire spread (i.e., landscaping, fencing) and determining where bylaws can be updated or strengthened to reduce wildfire risk to development (such as adopting bylaws tied to wildfire hazard levels and requiring minimum standards for access, water supply, construction materials and techniques, and vegetation management) can help accomplish the goal of a more wildfire resilient community.

The review of Nelson's existing suite of bylaws, plans, and legislation for this CWRP found that, altogether, these policies are comprehensive and sufficiently fulfill most needs for mitigating fire ignition and wildfire hazards on private and municipal land in the municipality. Opportunities to update or strengthen existing policies, and recommendations to incorporate an interface wildfire risk assessment into future plans, have been identified in Table 17.

There are key plans that have recently been developed that, if implemented, would produce outcomes that support community wildfire resiliency. The *Source Water Protection Plan* discusses different hazards that present a risk to drinking water infrastructure and forested watersheds, including wildfire. Additionally, The *Nelson Next Climate Plan* identifies wildfire as a risk to Nelson that will be exacerbated by climate change, and sets out tactics to adapt to and mitigate this risk. These plans are comprehensively reviewed in Section 2.5.

Some of the plans reviewed have implications for the wildfire resiliency of Nelson residents, living within the municipality, but are written for jurisdictions outside the municipal boundaries. As a result, following up on the recommendations to implement these plans may involve coordinating and cooperating with other agencies. These plans are identified in Section 2.5 and 2.6, and the process of coordinating and cooperating with other agencies is discussed in Section 5.4.

Because the Nelson municipal boundaries are compact, the municipality itself is not large, and areas with continuous stands of forest within the municipal boundaries are small, there are fewer opportunities for the municipality itself to legislate and plan for wildfire risk reduction at the landscape level. Critical infrastructure that Nelson relies on provide basic services to residents (e.g., drinking water) is also located outside municipal boundaries. Accordingly, engagement and cooperative partnership with other agencies has been and continues to be a crucial avenue to pursue community wildfire resiliency objectives.

Within municipal boundaries, another important planning tool is Development Permit Area policy. This, and other bylaws that relate to neighborhood development, are reviewed in Section 5.3.

Table 17: Legislation and planning recommendation and action items.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: Provide the means for Nelson to implement wildfire risk reduction actions through bylaws and legislation by outlining local government responsibilities regarding wildfire.							
5	Low	**Develop standard operating procedures that guide debris removal from hazard tree felling.**	'Downburst' storm events have resulted in a high frequency of windthrow events in forests, including on municipal lands, which can result in significant surface fuel loading. A management standard that details how to remove hazardous fine fuels while retaining beneficial habitat features (e.g., coarse woody debris, wildlife trees) should be developed and applied.	City of Nelson (Parks)	1 year	Standard operating procedures adopted.	Eligible for UBCM CRI funding.
6	Moderate	**Review and update procedures for allowing permitted outdoor burning for residents, during select windows of time as authorized by the Fire Chief.**	As discussed further in Section 5.7, there are challenges to hauling out yard waste and woody debris to tip at a landfill or chip. Currently, a brief window of time where residents may obtain a permit for backyard burning may be opened at the discretion of the Fire Chief. Usually this occurs in spring. Nelson should review and update the procedures associated with this program, to encourage further community uptake in it, while maintaining the standards that ensure responsible participation. Consider assessing staff capacity, and consider the possibility of offering an online permitting system, as well as linking public outreach about this program to	City of Nelson (Fire & Rescue, FireSmart Coordinator)	2 years	Feasibility of FireSmart Backyard Burn permit determined; if feasible, permit system developed and adopted.	Eligible for UBCM CRI funding.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
			other FireSmart initiatives in the municipality.				
7	High	**Implement the recommendations of the 2021 Source Water Protection Plan.**	It is possible that an interface wildfire, that ignites and burns in the City of Nelson watershed could result in adverse impacts to water quality. The recommendations of this plan, which specifically analyzes risk to drinking water supply, should be undertaken.	City of Nelson (Parks)	6-8 years	Plan adopted.	Local government funding.
8	High	**Implement the recommendations of the *Nelson Next Climate Plan*.**	The *Nelson Next Climate Plan* incorporates recommendations for adapting to the changing climate that is associated with increased likelihood of wildfire (e.g., droughts, heat events), as well as to reduce the risk of an interface wildfire, that this report endorses.	City of Nelson (Development Services & Engineering)	Ongoing	Wildfire Development Permit Area section of Nelson OCP reviewed and updated as necessary.	Eligible for UBCM CRI funding.

5.3 DEVELOPMENT CONSIDERATIONS

The City of Nelson has taken important steps to adopt and implement development policies to mitigate wildfire risk in interface areas of the municipality, and to begin to embed FireSmart practices and consideration into neighborhood development. Updating these policies when necessary and ensuring their effective implementation should be a priority for the municipality.

Important factors that can be planned for (and regulated through the land use planning and development process) which affect public safety during a wildfire include:

- Location of development, including hazardous or vulnerable land uses, in relation to high hazard forested vegetation, steep slopes, and other geographical features that contribute to extreme fire behavior.
- Access and circulation patterns.
- Availability and adequacy of water supply.
- Type of construction materials on structures and attachments (privately and publicly owned).
- Lot size and structure density.
- Design guidelines and architectural standards.

Ensuring adequate access and circulation is important to facilitate entry of first responders to neighborhoods in the event of an interface wildfire incident, and the exit or evacuation of residents as necessary in any emergency. Neighborhood design that relies on a single road in and out greatly restricts the flow of traffic and can significantly compromise safe ingress/egress in emergency situations. Design that includes alternative routes, wide roads, sufficient vegetation clearance from roads, and surge capacity for arterial roads are important factors in ensuring community safety.

Nelson has had a Natural Environment and Hazardous Lands Development Permit Area in place since 2008 with design requirements for structures with property lines abutting wildland areas. In 2019, the development permit requirements were reviewed and updated to align the legislation with the most recent FireSmart. Acceptable building materials were updated, and requirements for roofing materials, exterior wall finishes, and requirements were revised to provide more detail. A non-combustible surface, 1.5 meters in width, must now be installed around the perimeter of the main structure and any attachments. Landscaping requirements, previously optional, were made mandatory in this revision. Within 10 meters of the structure, only fire-resistant plants and materials are permitted, and maintenance for existing vegetation is required. A provision was also added, requiring a covenant to be registered on title to remind future property owners of the development and landscaping requirements. Concurrently, the Off-Street Parking and Landscaping bylaw was amended so that, throughout the entire municipality, it is no longer permissible to plant new flammable coniferous vegetation within 1.5 meters of homes and structures. This does not affect existing vegetation.

At the time of writing, Nelson has contracted another report for development, which will comprehensively analyze building materials and identify whether they are fire-rated and appropriate for use in wildfire interface areas. The goal of this plan is to provide a resource for the public, developers,

real estate agents, and contractors to make FireSmart-informed decisions about building design and renovations.

While the Development Permit Area remains a relevant and effective policy tool, opportunities for further development at the wildland-urban interface in Nelson are relatively constrained. Overall, little construction on new buildings at the interface was being undertaken in 2022. The wildland-urban interface is relatively fixed, with established neighborhoods reaching out to the boundary of the municipality. As a result, the Development Permit Area will apply mostly to single-lot re-developments.

Instead, this report identifies the following features of existing development, as more pressing challenges for Nelson:

- **Narrow, winding, and steep roadways** that can restrict first responder access, or resident evacuation. There is little opportunity to ameliorate these neighborhood features and, instead, preparedness and consideration of the possible challenge they present is important.
- **High structure densities** in some neighborhoods – where smaller lots, main structures grouped close together with outbuildings on single properties, and abundant vegetation increase the risk for fire to move rapidly structure-to-structure.

Further understanding of this issue, and the risks associated with it, may be necessary before action can be taken. However, this is an important issue to gain a comprehensive understanding of in the community, because when interface fires behave in this way – rapidly igniting multiple structures – a 'WUI disaster' scenario can occur, where fire suppression capacity is overwhelmed. Nelson Fire & Rescue, in cooperation with the Emergency Management Coordinator, could consider pursuing funding for a spatial analysis to be conducted of structure densities within Nelson neighborhoods. They should investigate whether a simulation of interface fire events in different structure densities can be completed, and if so, whether it will provide them sufficient information to take policy action on this issue. Based on the outcome of this potential study, areas within the community at elevated risk, could be engaged with specifically, and emergency responders in the area could be made aware of the locations where preparedness may matter most.

Additionally, the construction of critical infrastructure should be considered through a wildfire lens. An inventory of critical infrastructure was listed in Section Community Description. Critical infrastructure assessments have not been completed. However, field assessments of some critical infrastructure found FireSmart principles for structure maintenance and landscaping were observed. This inventory was not comprehensive though, and older pieces of critical infrastructure embedded in interface or forested areas are particularly vulnerable to possible damage in the event of fire. Assessments of critical infrastructure are recommended as a result.

Finally, it should be noted that the City has set priorities for developing new municipal infrastructure and buildings with low-carbon materials and in alignment with climate objectives laid out in policies and plans such as the *Nelson Next Climate Plan.* Wildfire design guidelines for developers, and building

materials and design adopted by the City for development of new municipal structures, should not contradict these objectives.

A summary of recommendations that Nelson can implement to embed FireSmart practices and considerations into development are detailed below in Table 18.

Table 18: Development Considerations recommendation and action items.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: To embed FireSmart practices and considerations into all development within Nelson.							
9	High	**Engage a qualified professional (such as a Local FireSmart Representative) to update or complete formal FireSmart assessments of critical infrastructure.**	Plan and implement action items in the sequence of critical infrastructure importance.	City of Nelson (Fire & Rescue, FireSmart Coordinator), consultant support	3 years	Critical infrastructure assessments completed and action items being planned for.	Eligible for UBCM CRI funding.
10	Low	**Use fire-resistant construction materials, building design, and landscaping for all critical infrastructure when completing upgrades or establishing new structures.**	Plan and implement action items in the sequence of critical infrastructure importance.	City of Nelson (Development Services & Engineering) consultant support	Ongoing	New critical infrastructure is FireSmart.	Local government funding.
11	Moderate	**Conduct a study to determine neighborhoods at the highest risk of 'WUI disasters.'**	WUI disasters occur when fire spreads rapidly from structure to structure, overwhelming the capacity of fire suppression resources. Consider conducting a spatial data modeling study to analyze structure density patterns and other neighborhood attributes, to determine areas in the City of Nelson that are most vulnerable to these events. See further discussion of this in Section	City of Nelson (Fire & Rescue, FireSmart Coordinator), consultant support	Study: 1-2 years Mitigation Work: 6-8 years	Study feasibility is determined, and/or study completed.	Local government funding, potential eligibility for UBCM CRI funding, or Columbia Basin Trust funding.

5.4 INTERAGENCY COOPERATION

Identifying and linking stakeholders, such as staff members from different municipal government departments, emergency services, private critical infrastructure operators, regional and provincial government agencies, and licensees, allow for the implementation of projects that overlap multiple jurisdictions.

Community FireSmart Resiliency Committee (CFRC)

Nelson's Community FireSmart Resiliency Committee is comprised of local government members, as well staff members from the Regional District of Central Kootenay and BC Parks. Table 19 below details the agencies involved, their current representatives and titles, and their role within the CFRC.

Table 19: Nelson's Community FireSmart Resiliency Committee (CFRC).

Agency	Title	Role in CWRP Development	Future Opportunities
Nelson Fire & Rescue	Fire Chief	Provided data, information, and other relevant plan content, including local level fire response knowledge and wildfire risk reduction initiatives; coordination of CFRC activities; provided review and input.	Coordinate with other municipal departments to achieve the implementation of CWRP recommendations.
	Fire Captain/Wildfire Mitigation Specialist		
	Fire / Emergency Management Executive Assistant		
	FireSmart Coordinator	Provided information and ongoing updates of FireSmart 2022 programming; provided review and input.	Support implementation of FireSmart education recommendations through public outreach, building on experience with 2022 programming.
Nelson Emergency Management Program	Emergency Management Coordinator	Provided data, information, and other relevant plan content; provided advisory support to determine CWRP actions; provided review and input.	Support implementation of CWRP recommendations as applicable to department role by providing technical expertise, background knowledge and information.
Regional District of Central Kootenay	Wildfire Mitigation Supervisor		
	FireSmart Coordinator		
BC Parks	Conservation Specialist (Interior Region – Kootenay / Okanagan)	Provided information and data, and assisted in an advisory capacity by providing input, and identifying areas of concern regionally and specific to West Arm Provincial Park.	Can collaborate with Nelson municipal staff to implement recommendations from this report specific to West Arm Provincial Park, including fuel management treatments, and

Agency	Title	Role in CWRP Development	Future Opportunities
	Lands and Resource Coordinator		maintain a strong relationship with Nelson municipal staff.
	Kootenay Lake Supervisor		
Ministry of Forests	Lands and Resource Coordinator, Wildfire Risk Reduction, Selkirk Resource District	Provided data, information, and other relevant plan content; provided advisory support to determine CWRP actions; provided review and input.	Support implementation of CWRP recommendations as applicable to department role by providing technical expertise, background knowledge and information.
	Wildfire Risk Reduction Specialist		

There is also an established history of interagency cooperation for wildfire risk reduction in Nelson.

The Community FireSmart Resiliency Committee evolved out of previous working groups that came together for similar purposes:

- **The 2015 CWPP** was completed with an extensive consultation process involving the RDCK, BC Parks representatives, and engagement with other local environmental and recreational groups.
- **The West Arm Provincial Park Fire Management Plan** was completed in 2016 and involved coordinated efforts between BC Parks and Nelson.
- **Fuel management treatments subsequently completed in West Arm Provincial Park**, based on recommendations made in that plan, also required cooperative work between these two parties.
- **Fuel management treatments in other nearby Provincial Parks** have involved work between BC Parks and the Regional District of Central Kootenay.

As described in the 2015 CWPP, there has been a particular need for this type of interagency work, because Nelson's critical infrastructure is not all located within municipal boundaries. The source intake and other infrastructure to supply Nelson's drinking water is located near Five Mile Creek in West Arm

Provincial Park. Additionally, Nelson Hydro, the municipal hydroelectric utility provider, has infrastructure located on land which is held municipally but located outside the town centre. Landscape level risk reduction to protect community assets in this area has always involved coordinating with multiple parties. This remains the case currently.

While several projects requiring the cooperation of different agencies have been undertaken since 2015, formalized meetings and a consistent communication plan have not been maintained. Regular meetings and communications can optimize coordination, by making it more likely that all parties are aware of each other's top priorities, current projects, possible capacity challenges, and preferences for resource allocation. It can also reduce the likelihood of efforts being duplicated, or fuel treatment implementation commencing without appropriate stakeholder and landholder information sharing processes.

Effective coordination can make regional projects possible, opening the door to increased funding and working at a larger scale than for individual agencies. The Community FireSmart Resiliency Committee recognizes the strengths of a coordinated, interagency approach to wildfire risk reduction work. Accordingly, regular meetings of a committee to coordinate wildfire risk reduction activities in Nelson and the surrounding area was initiated concurrently with this CWRP. A defined area within which collective efforts would be targeted was confirmed, and is illustrated below in Map 7. As part of the startup of a regularly Community FireSmart Resiliency Committee meeting, an open house was held in the fall of 2022 to update the public on wildfire risk reduction initiatives that had been occurring around the Nelson area.

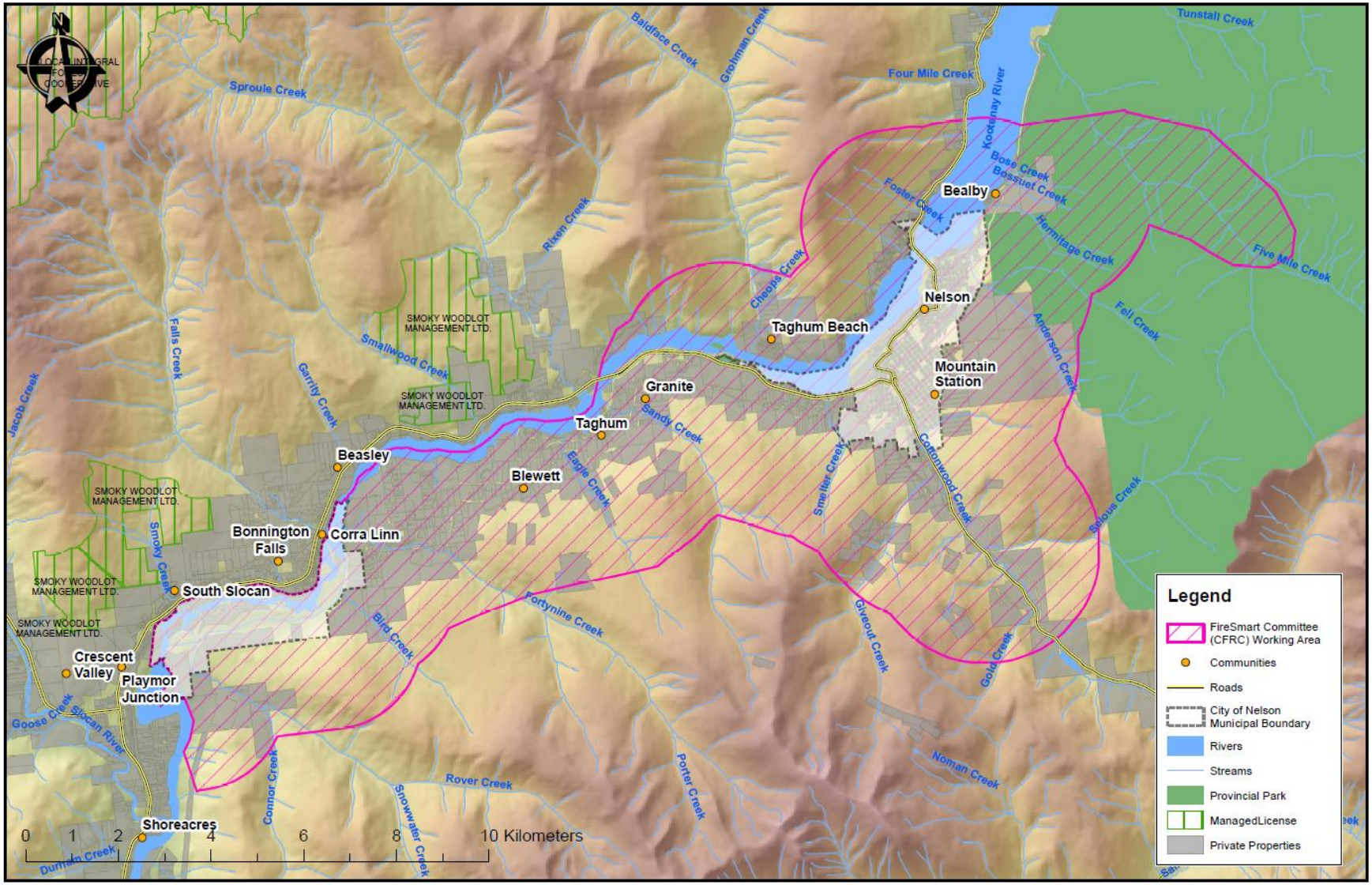
Since partnership has been effective in the past, and recognizing the benefits it can provide in the future, maintaining regular meetings and communications of this committee is a central recommendation of this report. An additional recommendation is engaging with other land manager agencies, outside of Nelson municipal departments, to expand the area in which wildfire risk management operations might occur. Such agencies might include:

- **Nelson Hydro,** which manages extensive areas of right-of-ways nearby and within municipal boundaries. An increased understanding of ignition hazards, relevant land management concerns or priorities, and Nelson Hydro's schedule of vegetation maintenance could be achieved through an increased frequency of communication.
- **Atco Wood Products**, which operates on Crown land to the southeast of the municipality, nearby to areas of interest for fuel treatment along Giveout Creek road. Engagement with Atco to discuss proposed harvesting in this area, as well as their concerns and priorities for forest management, would benefit fuel management treatment planning.
- **Anderson Creek Timber**, which holds private managed forest land that abuts a segment of the municipal boundary. During engagement for the purposes of developing this CWRP, Anderson Creek Timber's contracted forest management (Monticola Forest Ltd.) stated their interest in supporting Nelson's wildfire risk reduction goals. Continued engagement with Anderson Creek Timber to discuss possibilities, logistics, and barriers to implementing fuel management

treatment on private land would increase the likelihood of the eventual implementation of such works.

- **Teck Resources, BC Hydro, and FortisBC,** who manage / own land overlapping and close by the southwest Eligible WUI area. Teck completes fuel management in some interface areas (e.g., around Rossland interface). All three of these companies could be engaged to share information about hazard assessments that may have been completed in the Nelson area, or for Nelson to advocate for hazard assessments to be completed adjacent to municipal lands or critical infrastructure.

Recommendation and action items Nelson can implement to continue growing interagency relationships and increase interagency cooperation are listed below in Table 20.



Map 11. Community FireSmart Resiliency Committee Working Area.

Table 20: Interagency Cooperation recommendation and action items.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: To broaden from a department or agency single jurisdiction-based approach to a risk driven, multi-agency and multi-scalable approach.							
12	High	**Hold regular meetings of the Nelson Community FireSmart & Resiliency Committee (CFRC).**	Meetings should occur regularly to ensure a coordinated approach to the fulfillment of recommendations. Furthermore, funding for wildfire risk reduction activities may become contingent on these regular meetings.	All parties involved in CFRC	Ongoing	Meetings held according to established schedule.	Eligible for UBCM CRI funding.
13	Moderate	**Create a communications plan for the CFRC.**	This should outline the CFRC's plan for information sharing with third parties, to ensure that messaging is efficient, effective, and consistent.	All parties involved in CFRC	1 year	Communications plan finalized.	Eligible for UBCM CRI funding.
14	High	**Evaluate opportunities to support Indigenous participation with the CFRC.**	Opportunities to support participation may include identifying available funding.	All parties involved in CFRC	Ongoing	Opportunities identified and invitations extended.	Eligible for UBCM CRI funding.
15	High	**The Nelson FireSmart Committee should meet regularly with Ministry of Forests' Wildfire Risk Reduction staff.**	Coordination between Wildfire Risk Reduction staff and the Nelson FireSmart Committee may accelerate hazard identification, prescription, and treatment of forest stands outside the municipal boundaries of the City of Nelson.	All parties involved in CFRC	Ongoing	Meetings held according to established schedule.	Eligible for UBCM CRI funding.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
16	High	**The CFRC should meet annually with Nelson Hydro and Fortis BC staff.**	Annual meetings should be held to follow up on projects and initiatives of relevance to each party. Consider focusing discussion on planned maintenance, planned monitoring of vegetation treatments, and the status of the 5-Year Maintenance Plan.	All parties involved in CFRC	Ongoing	Meetings held according to established schedule.	Eligible for UBCM CRI funding.
17	High	**Investigate novel solutions for treatment of private managed forest land.**	Engage with funding organizations (e.g., Columbia Basin Trust, UBCM CRI program officers), as well as forest professionals representing Anderson Creek Timber, to investigate novel solutions for treatment of Anderson Creek Timber land. Consider engaging as well with Nelson Cycling Club for potential volunteer work along established trails.	All parties involved in CFRC	Ongoing	Engagement held and feasibility of treatment in this area determined.	Local government funding.
18	Low	**Request information sharing from private critical infrastructure companies.**	Private critical infrastructure companies that have Crown tenure or private landholdings near the Nelson wildland-urban interface include Nelson Hydro, FortisBC, Teck Resources, and BC Hydro. Information sharing should occur to gather information about potential wildfire risk on these lands, and if hazard assessments or fuel management treatments have been undertaken.	City of Nelson (Fire & Rescue)	1 year	Invitation for information sharing extended.	UBCM CRI funding.

5.5 CROSS-TRAINING

Nelson Fire & Rescue provides training to its members for interface specific wildfire events and to gain experience in interface wildfire incidents. Fire department personnel numbers remains the same as reported in the 2015 CWPP, and so does the in-house training program, broadly. The department is made up of 11 full-time members, and 21 auxiliary firefighters (described further in Section 5.6). Nelson Fire & Rescue focuses in-house training on structural firefighting but also includes annual wildland interface training in the spring. Nelson Fire & Rescue reports regular training on use and deployment of the Structural Protection Unit the department maintains. Additionally, fire department members hold the following interface wildfire -related certifications:

Program	Members Certified
WSPP-WFF-1	21
S100, S185, or S215	7 (3 career & 4 auxiliary)
"Train-the-trainer"	2

Overall, it is recommended this program be maintained, and expanded where possible. Budget and time allotment were cited as barriers to expanding the in-house training program. Accordingly, recommendations are made in this section to seek opportunities for training that are grant fundable, including specific courses, and multi-jurisdiction training exercises.

Training opportunities include:

- Wildfire Risk Reduction Basics Course
- Fire Life & Safety Educator
- Incident Command System
- S-100 (Basic Fire Suppression & Safety)
- SPP-WFF1 (Wildland Firefighter Level 1)
- S-185 (Fire Entrapment Avoidance & Safety)
- S-231 (Engine Boss)
- WSPP-115 (Training for Structure Protection Unit Crews)
- Task force leader for structure protection
- Structure protection group supervisor

Nelson Fire & Rescue responds jointly to wildfires with BCWS one to two times per year, which has provided exposure to BCWS operations. Additionally, both Nelson Fire & Rescue and BCWS identified a positive working relationship with each other. However, the 2015 CWPP identified a lack of cross-training with BCWS, which currently remains the case. It is recommended that cross-training events be initiated, as there are benefits to be gained from scheduling regular training sessions. Training sessions for crews can focus on re-introducing suppression equipment for each agency, and identifying and sourcing solutions where incompatibilities may exist. In recent years Nelson has established its own

Emergency Management Program, removing itself from the Emergency Management Program run by the Regional District of Central Kootenay. Depending on how they are structured, training sessions with BCWS may increase the response and capability of this new organizational structure as well, by strengthening the working relationship between Emergency Operations Centre staff members and BCWS, who may have to liaise in case of an interface fire emergency.

With other fire departments in the RDCK, with which mutual aid agreements are held, some annual training exercises do take place – primarily the Superior Shuttle Re-Certification to meet Fire Underwriters' Survey requirements. Annual training exercise programming should be maintained, and expanded where appropriate. Consistent, scheduled, and purposeful engagement is a benefit for engagement across municipal fire departments for similar reasons as with BCWS. A recommendation of this CWRP that is proposed to help Nelson and surrounding communities achieve these benefits, is hosting an annual in-person, multi-agency training exercise (Table 21).

It should be noted that hosting training exercises do not imply taking on responsibilities outside of roles for each agency. Rather, the focus of these training exercises should be to enhance understanding of the capacity and capabilities of agencies with which Nelson might cooperate with in the event of an interface wildfire event. This will allow Nelson Fire & Rescue to focus their training and professional development within the role of their agency.

Table 21: Cross-training recommendation and action items.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: To support the development of comprehensive and effective wildfire risk reduction planning and activities, as well as a safe and effective response.							
19	Moderate	**Consider hosting an annual in-person multi-agency training exercise with BCWS.**	Consider hosting in an area where multiple agency response is likely, such as West Arm Provincial Park, and inviting mutual aid partners to participate.	City of Nelson (Fire & Rescue, FireSmart Coordinator, Emergency Management Coordinator)	3 years	In-person exercise held.	Eligible for UBCM CRI funding.
20	High	**Host an annual tabletop training exercise with BCWS.**	While an in-person multi-agency exercise can be logistically challenging to organize annually, Nelson Fire & Rescue should consider hosting a tabletop exercise each year, to support a strong relationship with local BCWS staff.	City of Nelson (Fire & Rescue, FireSmart Coordinator)	Ongoing	Annual exercise held.	Eligible for UBCM CRI funding.
21	High	**Nelson Fire & Rescue should expand their in-house wildland-specific training program.**	Consider establishing an annual spring training refresher focused on interface wildfire response.	City of Nelson (Fire & Rescue)	Ongoing	Annual spring refresher training held.	Eligible for UBCM CRI funding.
22	High	**Maintain the number of members holding SPP-WFF1 certification and expand the number of members with additional wildland firefighting certifications.**	Additional training opportunities in which members could participate, include S-185, S-231, WSPP-115, or task force leader.	City of Nelson (Fire & Rescue)	Ongoing	Number of members with additional certifications expanded.	Eligible for UBCM CRI funding.
23	High	**Pursue funding to enable Nelson Fire & Rescue members to attend the FireSmart Symposium or**	Relevant learnings should be shared at CFRC meetings.	City of Nelson (Fire & Rescue)	Ongoing	Attendance at 2023 symposium(s).	Eligible for UBCM CRI funding.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
		Wildland Urban Interface Symposium.					
24	Moderate	**Pursue funding to enable Nelson Fire & Rescue members to complete Structural Protection Unit training.**	Ensure that training for Nelson Fire & Rescue members is upgraded and maintained concurrently with equipment upgrades.	City of Nelson (Fire & Rescue)	Ongoing	Training completed.	Eligible for UBCM CRI funding.

5.6 EMERGENCY PLANNING

This section provides a high-level review of Nelson's preparedness for, and resources available to address, an interface wildfire emergency. Local government wildfire preparedness and resource availability are critical components of efficient wildfire prevention and planning.

Emergency Management Planning

When the 2015 CWPP was written, Nelson was a participant in the Regional District of Central Kootenay's Emergency Management Program. This program dictated emergency response protocols amongst member communities, grouped by electoral areas. The 2015 CWPP recommended that Nelson take a more 'active' role in emergency management. Further assessment determined that Nelson would benefit from an individual Emergency Management Program that focused on specific needs and challenges for Nelson.

In 2018, Nelson's Emergency Management Program bylaw was passed, which enabled Nelson to take on this responsibility. Once enabled through bylaw, a three-year transitional process commenced to establish a program in compliance with the *Emergency Program Act,* in which the Emergency Operations Centre was outfitted, corporate training completed, and an Emergency Management Coordinator hired, supported by UBCM grant funding. Since 2019, a Hazard, Risk, and Vulnerability Assessment has also been completed.

A community evacuation plan is complete as of early 2023. In the fall of 2022, an evacuation plan exercise was carried out, as a combined exercise in raising public awareness of emergency management, and a multi-agency exercise in testing the new plan. Continuing to host these types of exercises is recommended, in order to increase strengthen the capacity of this new organization and identify any vulnerabilities in planning. Promotion of Nelson's emergency notification app is also ongoing, with approximately 6,500 residents registered so far.

Pre-Incident Planning

In addition to evacuation planning, the completion of a wildfire pre-incident plan is also recommended as an important emergency preparedness measure. A pre-incident plan is a compilation of essential fire management information needed to save valuable time during fire suppression operations. To optimize preparedness a wildfire response plan would be reviewed annually and tested and practiced periodically.

In the 2016 West Arm Provincial Park Fire Management Plan, a similar recommendation was made to complete a tactical plan. It is recommended that Nelson consider the feasibility of completing this pre-incident planning work in tandem with BC Parks. If it is determined that these projects would not be feasible to complete together, it is recommended that an information sharing project phase with BC Parks, Regional District of Central Kootenay staff, and other stakeholder be included in the plan development process.

Example topics for a wildfire pre-incident plan are show below in Table 22.

Table 22. Sample components of a wildfire pre-incident plan.

Command	Escape Fire Situation Analysis Pre-positioning needs (e.g., water delivery systems, crews and / or aircraft on standby) Draft delegation of authority Management constraints Review interagency agreements Assess structure protection needs Closure procedures
Operations	Identify helipad locations, flight routes, restrictions, water sources Control line locations Natural barriers Options for safety zones Staging areas Fuel caches
Logistics	Identify possible base camp locations Roads and trails Vehicle limitations Utilities Communities (radio frequencies, phone)
Planning	Base and topographic maps Vegetation / fuel maps Hazard locations Infrared imagery Archaeological, cultural, ecological value maps Water sources Land status Priority zoning

As part of pre-incident planning, Nelson may consider developing local daily action guidelines based on expected wildfire conditions. Table 23 below provides a template that can be tailored specifically for Nelson, outlining actions that staff, fire department members, and other emergency staff can take as fire danger levels change throughout the year.[23] Year-round, fire danger signs posted throughout municipality should be updated to reflect the current fire danger.

Table 23. Example of a Wildfire Response Preparedness Condition Guide.

FIRE DANGER LEVEL	ACTION GUIDELINES

[23] CRI FCSF 2021 CWRP supplemental instruction guide

LOW	• All Community staff on normal shifts.
MODERATE	• All Community staff on normal shifts. • Information gathering and dissemination through Kelowna's CFRC.
HIGH	• All Community staff on normal shifts. • Daily detection patrols by staff. • Regional fire situation evaluated. • Daily fire behavior advisory issued. • Wildland fire-trained Community staff and EOC staff notified of Fire Danger Level. • Establish weekly communications with CFRC. • Hourly rain profile for all weather stations after lightning storms.
EXTREME	• Rain profile (see III). • Daily detection patrols by Staff. • Daily fire behavior advisory issued. • Regional fire situation evaluated. • EOC staff considered for stand-by. • Wildfire Incident Command Team members considered for stand-by/extended shifts. • Designated Community staff: water tender and heavy machinery operators, arborists may be considered for stand-by/extended shifts. • Consider initiating Natural Area closures to align with regional situation. • Provide regular updates to media Services members/Community staff on fire situation. • Update public website as new information changes.
FIRE(S) ONGOING	• All conditions apply as for Level IV (regardless of actual fire danger rating). • Provide regular updates to media/structural fire departments/staff on fire situation. • Mobilize EOC support if evacuation is possible, or fire event requires additional support. • Mobilize Wildfire Incident Command Team under the direction of the Fire Chief. • Implement Evacuation Alerts and Orders based on fire behavior prediction and under the direction of the Fire Chief.

Firefighting Resources

The table below summarizes available firefighting resources to members of Nelson Fire & Rescue. Overall, these resources are sufficient to respond to an interface wildfire.

Table 24: Select inventory of Nelson Fire & Rescue firefighting resources for use at interface fire incidents.

Fire Department	Number of Stations	Number of Members	Apparatus Type	Description / Comment
Nelson Fire & Rescue	1	• 1 Fire Chief • 1 Assistant Chief • 4 Captains	Fire Engines	2 vehicles
			Rescue Trucks	1 vehicle
			Ladders	1 vehicle

Fire Department	Number of Stations	Number of Members	Apparatus Type	Description / Comment
		• 6 Career Firefighters • 21 Auxiliary Firefighters • Secretary-Dispatcher	Tender	1 vehicle
			Structure Protection Unit	1 unit, not upgraded to provincial standards
			Interface / wildland firefighting equipment	Portable pumps, hose, 2 collapsible tanks / bladders

The Structure Protection Unit gear inventory is one notable opportunity to upgrade firefighting resources. A Structure Protection Unit is a trailer equipped with interface fire equipment and, when stocked according to Provincial standards, can be deployed to interface fire incidents where structural firefighting crews work alongside BCWS crews. Nelson's Structure Protection Unit was outfitted several years ago and does not currently meet these standards. It is recommended the equipment inventory be reassessed, the necessary upgrades determined, and equipment purchased in order to allow fire department members to deploy with BCWS. As well, it is recommended that any other wildland firefighting gear belonging to the fire department be inventoried, with support from BCWS as needed, and any necessary upgrades identified.[24]

Additionally, it was noted that, while the number of apparatuses Nelson Fire & Rescue maintains are sufficient for the municipality's needs, these vehicles must always remain within municipal boundaries. There is not enough firefighting apparatus within the community to also share these resources outside of the fire protection area. As apparatus are phased out and eventually upgrades brought in, a plan or procedure should be developed to guide how and where the older vehicles can be maintained. Keeping this older equipment would allow more flexibility in resource sharing with nearby communities with whom Nelson Fire & Rescue has mutual aid agreements formalized with, and could also possibly be deployed in wildland fire incidents.

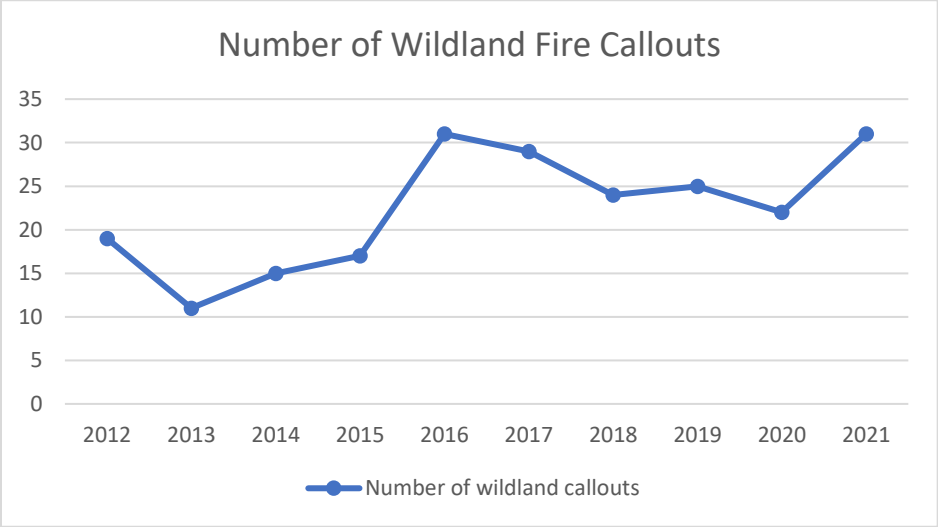
Finally, Nelson Fire & Rescue is taking action to understand the feasibility of establishing a residential rooftop sprinkler program. Residential rooftop sprinklers are sprinkler heads that can be attached, either permanently or temporarily, to a fixture point on the roof of a building. The sprinkler is run from a fire hose hooked up to it. In an interface wildfire scenario, the purpose of running rooftop sprinklers is to reduce the likelihood of the structure igniting. Rooftop sprinklers are endorsed as one of many tools that are effective in reducing the likelihood of home ignition, by FireSmart BC. In 2022, Nelson received funding to undertake a water system study, that will assess the feasibility of the city's water system to support residential sprinklers on every structure. At the time of writing, this study is not yet complete. Accordingly, it is not yet known if sufficient water flow could be provided to support

[24] Funding historically offered through UBCM CRI Community Emergency Preparedness Fund to support volunteer and composite fire departments purchase equipment.

residential sprinklers, and further consideration and planning is required before this project would be appropriate to implement.

Past Incident Response

Overall, the total number of callouts remain similar in 2022 as in 2016, at approximately 1200 per year. Nelson Fire & Rescue reports that in the past five years, they have been called out to a greater proportion of medical and other emergencies (e.g., motor vehicle accidents). Notably, while total callouts have not increased, the number of wildland fire callouts have increased, with higher callouts for this type of incident from 2016-2021 (since the last CWPP was written), compared to 2012-2015. This data demonstrates the importance of wildfire-specific training and equipment.



Mutual aid partnerships have not changed since 2015. Agreements are in place with all adjacent RDCK fire departments. Rates of mutual aid callouts also remain similar, with requests made 1-2 times per year.

Recommendations and action items related to emergency planning are detailed below in Table 25.

Table 25: Emergency Planning recommendation and action items.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: To create specific wildfire response pre-incident plans so those responding to a wildfire emergency know who is available to help with what and when, and to improve Nelson's ability to respond to (during and after) a wildfire emergency.							
25	Moderate	**Update the equipment inventory of the Structural Protection Unit, including storage, to provincial deployment standards.**	Seek out funding to support this. Upgrading the Structural Protection Unit will allow Nelson Fire & Rescue members to be deployed as provincial resources and work with BCWS in other interface wildfire incidents, which provides valuable experience to firefighters.	City of Nelson (Fire & Rescue)	3-5 years	Structural Protection Unit is provincially deployable.	Eligible for UBCM CRI funding.
26	Moderate	**Develop a rooftop sprinkler plan and distribution pilot program.**	Prior to distribution of residential rooftop sprinklers, formalize water availability planning and establish a standard procedure for the use of these devices. Once planning is in place, make rooftop sprinkler devices available to residents. Ensure participating residents are supported with education and resources for additional FireSmart measures they can take to protect their homes.	City of Nelson (Fire & Rescue, FireSmart Coordinator)	3 years	Plan is completed.	Eligible for UBCM CRI funding.
27	High	**Complete evacuation route planning for the City.**	At the time of writing, funding has been secured and planning begun for a city-wide evacuation plan.	City of Nelson (Emergency Management Coordinator, Nelson Fire & Rescue)	1 year	Evacuation plan completed and adopted.	Local government funding.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
28	High	**Conduct a drill of the evacuation plan, when completed.**	Consider focusing this drill in interface areas or areas with known access and egress issues.	City of Nelson (Emergency Management Coordinator, Nelson Fire & Rescue)	1-3 years	Drill occurs.	Potential eligibility for UBCM CRI funding.
29	Moderate	**Complete a wildfire incident pre-plan.**	Engage with BC Parks, evaluate the feasibility of completing this plan in tandem with West Arm Provincial Park.	City of Nelson (Emergency Management Coordinator, Nelson Fire & Rescue)	5 years	Wildfire incident pre-plan developed and adopted.	Eligibility for UBCM CRI funding.
30	Moderate	**Maintain and promote availability of clean air & cooling spaces at public facilities during heat wave and air quality advisory alert periods.**	Exposure to smoke can affect residents' health.	City of Nelson (Emergency Management Coordinator, FireSmart Coordinator)	Ongoing	Promotion of clean air and cooling spaces occurs.	Potential eligibility for UBCM CRI funding, local government funding.

5.7 VEGETATION MANAGEMENT

The goal of vegetation management is to reduce potential wildfire intensity, and ember exposure to people, infrastructure, structures, and other values through manipulation of both natural and cultivated vegetation that is within or adjacent to the community.

Vegetation management can largely be accomplished through two different activities:

- ***Residential-scale FireSmart landscaping***: The removal, or reduction of flammable plants to create more fire-resistant areas in the FireSmart Immediate Zone, Intermediate Zone, and Extended Zone.

- ***Fuel management treatments***: The removal or reduction of forest and grassland fuels to reduce the rate of spread and head fire intensity and enhance likelihood of successful fire suppression.

A well-planned vegetation management strategy can greatly increase fire suppression effectiveness and reduce damage to property and to values. A comprehensive vegetation management plan for a community should include both of types of activities.

Residential-Scale FireSmart Landscaping

FireSmart standards applied to structures and associated residential landscaping increase the efficacy of adjacent fuel management treatments. Since private land makes up a significant portion of the WUI, residential-scale FireSmart landscaping is one of the most effective actions that can be taken to reduce wildfire risk in Nelson.

FireSmart landscaping at a residential scale involves the removal, reduction, or conversion of flammable plants (such as landscaping for residential properties, parks, and open spaces) to create more fire-resistant areas in the FireSmart Immediate Zone, Intermediate Zone, and Extended Zone. This is focused primarily in the Home or Critical Infrastructure Ignition Zones (Figure 2 below).

Figure 2: FireSmart home ignition zone.

Nelson has recently revised the Wildfire Design Guidelines that apply in the Development Permit Area around the interface, making FireSmart landscaping mandatory for new developments. At the same time, another bylaw was amended, restricting the planting of flammable conifer shrubs to further than 1.5 meters from the home. These bylaw revisions are aimed at guiding residents living at the interface to adopt FireSmart principles throughout their property, and residents living throughout the whole community, to protect the Immediate Zone of their homes (1.5 meters around the perimeter of the structure). However, these bylaw amendments do not address established landscaping, or vegetation in the Intermediate Zone or Extended Zone (1.5-10 meters, and 10-30 meters around structure perimeter). Delivering further public outreach and incentives for property owners are therefore important to increase uptake in FireSmart landscaping techniques.

Nelson has begun taking steps to deliver educate residents about FireSmart landscaping principles (discussed in Section 5.1) and to incentivize residents to adopt them. A rebate program was launched in 2021 to support residents making upgrades to their homes. A debris disposal program was piloted in 2020, where residents could drop off yard waste at neighborhood disposal bins located in select areas. While low uptake or engagement was not noted by Nelson staff, a particular challenge in continuing to offer these types of programs is the topography of the community. There are steep slopes, narrow

laneways, and tight corners to maneuver around, which means that access to some neighborhoods with a chipper, truck, and/or bin equipment to remove debris is challenging.

As a result, Nelson Fire & Rescue is looking towards alternate options for debris disposal. One possibility is encouraging uptake in the use of outdoor burn permits. There is a permit program already in place, authorized by *Fire Regulation and Prevention Bylaw No. 3268, 2014*. Based on fire weather index and fire danger information monitored by the fire departments, the Fire Chief may make permits available for residents looking to burn yard debris in their backyards. This permit window is weather dependent and usually lasts for 2-4 weeks. It is recommended that the procedures around this permitting program be reviewed and updated, to encourage more uptake by residents, while maintaining the standards that ensure responsible participation. Making the permit easier to complete, for example by creating an online application form, could be a consideration. This recommendation is listed in Section 5.2: Legislation and Planning.

Recommendations and action items related to residential-scale FireSmart vegetation are provided below in Table 27.

Fuel Management Treatments

Fuel management treatments are the manipulation or reduction of living or dead forest and grassland fuels to reduce rate of spread and head fire intensity, and to enhance the likelihood of successful suppression of potential wildfire events. Fuel treatments may be linear features, stretching a kilometer or more, to create fuel ‘breaks’ on the landscape. Or, they may occupy different polygon shapes, buffering around structures, critical infrastructure, or other values at risk.

The intent of establishing fuel treatments is to modify fire behaviour. They are designed to keep surface fires burning on the ground, not ‘laddering’ up into tree crowns, and becoming more dangerous crown fires. Fuel treatments can also provide anchor points to firefighting crews for suppression activities. The application of appropriate suppression tactics in a timely manner with sufficient resources is essential for fuel treatments to be effective. Fuel treatments require periodic maintenance to retain their effectiveness.

Nelson has established a robust fuel treatment program to manage hazardous fuels within municipal parks and green spaces. Since 2015, several significant fuel management treatments have taken place. The Selous area fuel treatment, located on the south side of the municipality, was undertaken with collaboration from Regional District of Central Kootenay and Kalesnikoff Lumber. Treatment was nearly completed in the fall of 2022. Post-treatment conditions will be characterized by the patchy retention of widely spaced, mature overstory trees, and open areas with intensive surface fuel abatement. This fuel treatment will function as a linear fuel 'break', against the southeast corner of the municipality, and aligned with double-wide walking path that can allow for first responder vehicle access in the event of an ignition or approaching fire to the fuel treatment area.

Demonstration-style treatments, that are located closer to residences have also been completed. In 2019 and 2020, a city-wide project of treating 'postage-stamp' sites on municipal land was completed. The objective of these fuel treatments was to address the many small allotments of municipal land that exist between private property lots and along road and distribution line rights-of-way. 20 of these small-scale sites were identified and treated in 2019-2020, with a total treatment area of 20.16 ha. In 2022, fuel treatment along the Nelson Rail Trail was completed, as a hybrid fuel-treatment and neighborhood clean-up event. A prescription for the site was completed, and a contractor felled larger-diameter trees as prescribed. A volunteer crew of local residents then completed surface fuel removal. In 2022 the 6.2 ha Mountain Station Reservoir project was completed.

This work to date, plus work completed in the municipality prior to the 2015 CWPP, means that many forested areas of Nelson have received initial fuel mitigation treatments. These treatments will require ongoing maintenance over the coming years. A challenge going forward for Nelson is to track these historical treatments, and ensure that the areas are revisited and re-treated on an appropriate timeline.

Several fuel treatments have been proposed for Nelson, as described in Table 26 and shown on Map 12. Three fuel management treatments are proposed outside of Nelson's municipal boundary. These treatment units were proposed in the 2015 CWPP, and are recommended again as an opportunity for coordinated implementation between Nelson, the Regional District of Central Kootenay, and Ministry of Forests Wildfire Risk Reduction staff, as discussed in the following section 'Interagency Cooperation for Vegetation Management'.

Recommendations for fuel management treatment locations are provided below in Table 26 and displayed in Map 12.

Interagency Cooperation for Vegetation Management

Nelson's primary approach to vegetation management should comprise fuel management treatments on municipal lands, and actions to increase community uptake of residential FireSmart landscaping efforts. A secondary effort should be engagement with other land managers to promote wildfire mitigation strategies in areas of land Nelson does not manage, but which influence the nearby wildfire environment and therefore local wildfire threat Nelson has undertaken several projects already that have involved this type of interagency cooperation – for example by working with BC Parks during the implementation of fuel management treatments in West Arm Provincial Park.

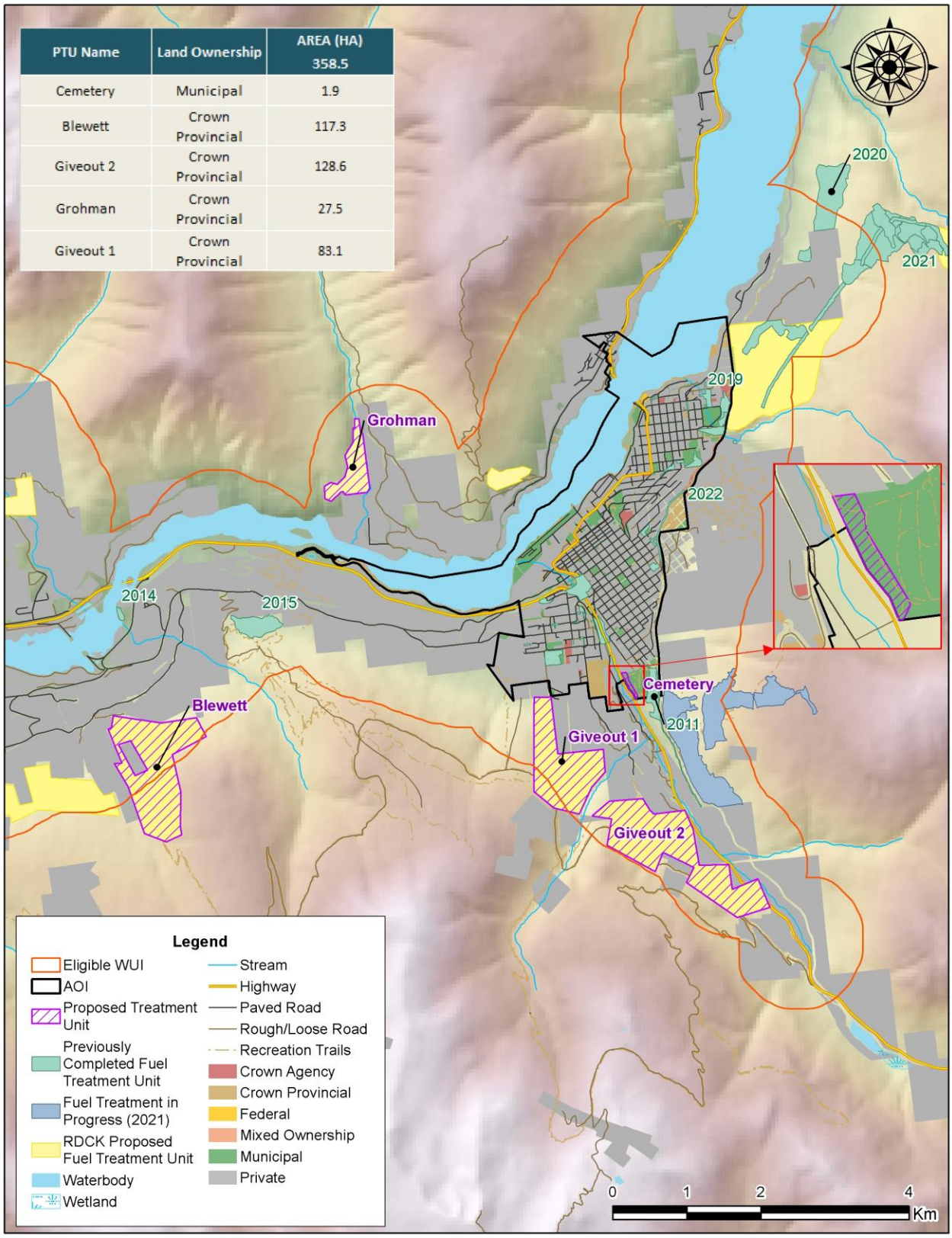
Both Nelson's 2015 Community Wildfire Protection Plan, and the 2016 West Arm Provincial Park Fire Management Plan recommended areas for fuel treatment. Treatment has targeted Harrop Procter and Five Mile water infrastructure locations, with both hand treatments and mechanical treatment techniques used. Another major achievement was a 22 ha prescribed burn that was completed in 2020 in cooperation with BCWS. Overall, more than half of the recommended treatment areas identified in the West Arm Fire Management Plan have been completed. A new "Land and Resource Coordinator" position has been funded within BC Parks, to provide more person-hours to fuel management treatment projects. Further fuel treatments that are planned include works near Strickland Creek, clean-up near Harrop, and implementation of a prescription written for Kokanee Park.

In Community FireSmart Resiliency Committee meetings, which were conducted while writing this CWRP, alignment and agreement was reached in priority areas for fuel management and treatment, outside of the Nelson municipal boundaries. Priority areas are (see map below):

- Giveout Creek
- Blewett (Morning Mountain)
- Grohman Narrows
- Bonnington

While outside the municipal boundaries of Nelson, these priority areas are relevant to highlight in this CWRP, because Nelson has an important role to play in planning fuel management treatment in these locations. Nelson is an important service provider in the region, often serving as a host community when rural areas nearby are on alert or receive evacuation orders. It is also a back-up Emergency Operations Centre location for the Regional District of Central Kootenay. Furthermore, while these priority areas are outside Nelson municipal boundaries, Nelson residents will also be beneficiaries of some of the proposed works, and therefore Nelson has role to play in advocating for completion of these projects.

Another important third-party land manager in the Nelson region is Nelson Hydro, which manages extensive right-of-way areas that runs east-west through forested areas between interface neighborhoods. Management of these rights-of-way, including monitoring of potential target vegetation (plant species that can contact or grow within limits of approach of power lines), and scheduled treatment of vegetation to protect this critical infrastructure is an activity with implications for wildfire risk in the Nelson area. Treatments that may be applied to rights-of-way to prevent hazardous or incompatible vegetation growth include brushing, mowing, felling, and debris removal. These activities are considered '*high risk'* as defined by the Wildfire Act, and are regulated by law to prevent ignitions during times of high fire danger. The right-of-way areas themselves, if not maintained appropriately, have the potential to grow over time into dense and hazardous vegetation. Right-of-way trespass and recreational use of maintenance roads, as well as illegal dumping on rights-of-way by members of the public can present issues to utility companies that prevent effective maintenance and access of these areas. Accordingly, interagency engagement and communication between Nelson and Nelson Hydro staff is recommended (Section 5.4) to enhance understanding of the cause and effect of these issues, as well as to report other concerns of wildfire hazard, fuel accumulations, and for Nelson Hydro to communicate the status of regularly scheduled maintenance activities.



Map 12: Proposed Fuel Treatment Units.

Table 26: Summary of Proposed Fuel Treatment Units (PTUs). [25]

PTU Name	Priority	Total Area (ha)	Description	Recommendation
Cemetery	High	2.51	This treatment unit encompasses a stand of trees on the slope between the edge of the Nelson cemetery and Highway 6. One double-wide trail to access the Graveyard Trails network travels through this unit. The stand is characterized by an immature conifer stand (pole / sapling & sub-merchantable diameters), stocked at a high density. The stand is self-thinning, producing abundant fine and coarse woody debris accumulations. Ladder fuels are patchy to continuous. Forest fuel type is C3.	City of Nelson should seek FCFS funding to treat this area. The objective of treatment in this location would be to reduce potential fire behaviour in this high-hazard stand adjacent to the highway and residences. Terrain stability should be considered in the prescription writing process. Manual thinning, some pruning, and surface fuel abatement are recommended in this area.
Blewett	Moderate	117.33	This proposed treatment area is outside of the Nelson municipal boundaries, but within the CFRC working area. It was first identified and assessed in the 2015 CWPP. It abuts private property boundaries in the rural Blewett area on the south side of the Kootenay River. This neighborhood is characterized by large lots, and properties intermixed amongst continuous forested vegetation.	This area has been identified as a concern for local wildfire risk by all members of the CFRC. Because the approach to wildfire fuels management in Nelson has focussed on a collaborative approach, and sharing resources, this treatment unit is included as a mutually agreed upon priority of the RDCK, Ministry of Forests, and City of Nelson. This large proposed treatment area is intended for further refinement, and delineation based on a detailed site evaluation at the prescription stage.

[25] Depending on UBCM CRI funding criteria at the time of application, this may constrain the potential for the City of Nelson to prescribe and implement treatment. For example, 2022 FireSmart Community Funding and Supports program criteria require review and support from BCWS for fuel management treatments located on Provincial Crown land. However, this unit is still recommended for treatment as part of this CWRP because: a) it is located within Nelson municipal boundaries, and adjacent to values-at-risk that serve the City of Nelson; b) treatment of this unit could provide positive outcomes for public safety of Nelson residents and Nelson first responder safety; and c) the identification of the hazardous characteristics and strategic benefits of treating this unit means that even if the City of Nelson is not authorized to implement treatment another agency may (e.g. Ministry of Forests, Lands, Natural Resource Operations, & Rural Development through the Wildfire Risk Reduction stream of CRI).

Giveout 2	High	128.60	This proposed treatment area is outside of the Nelson municipal boundaries, but within the CFRC working area. It was first identified and assessed in the 2015 CWPP. It abuts residences and properties within 2km of the municipality that back onto Silver King Road and Giveout Creek FSR. Giveout Creek FSR winds throughout the entire site, as well as a double-wide multiuse trail. The recently completed (2021) Selous area fuel management treatment is located 200 m - 1 km southeast, across Highway 6. The proposed treatment area is characterized by single-layer, second growth stands of sub-merchantable and merchantable diameters. Stands are moderately to densely stocked, and crown closure is high. Stem exclusion has already occurred, resulting in significant accumulations of fine, medium and coarse woody debris. Stands are diverse in terms of species but homogenous in structure and age class, presenting few interruptions to wildfire spread. The forest fuel type is C3. When completed, treatment in this unit would function as a landscape level fuel break, between continuous forested stands and the developed neighborhoods in and around Nelson.	Nelson residents would be a primary beneficiary of this proposed shaded fuel break, and as such, the City of Nelson should advocate to and cooperate with the RDCK to implement it. Both Nelson residents, and the Community FireSmart & Resiliency Committee have identified this area as a concern in terms of local wildfire threat. The same WTA sites that were assessed in 2015 were revisited in 2022 and re-assessed - the hazard rating has not changed at those locations. This large proposed treatment area is intended for further refinement, and delineation based on a detailed site evaluation at the prescription stage. Ministry of Forests Wildfire Risk Reduction may be the appropriate agency to lead work in this unit, as it is located on Crown land, and because mechanical work (i.e., using conventional logging equipment, through cooperation with local licensee) would likely be a primary method to implement treatment. Allocations of responsibility, and a cooperative structure similar to the Selous project (also located on Crown land, and completed in tandem with harvesting operations) could be an appropriate approach for this work.
Giveout 1	Moderate	83.12	This proposed treatment area is located adjacent to unit Giveout 2. Stands have similar characteristics and are of a similar age class, predominantly comprised of single-layer, second growth stands of sub-merchantable and merchantable diameters. Stand structure is more varied throughout this area, with some canopy gaps and lower crown base heights. The forest fuel type is C3. This proposed treatment area is separated from Giveout 1 by a large gully. Existing access through this unit is poor; however, completing treatment through mechanical works may involve access construction. This unit directly abuts properties at the edge of the municipal boundary of Nelson but also is outside of the municipality. When completed, treatment in this unit would function as a landscape level	For similar reasons to Giveout 2, the City of Nelson should advocate to and cooperate with the RDCK and the Ministry of Forests Wildfire Risk Reduction branch to implement this treatment. Steep slopes, terrain stability, and potentiality for debris flow events are currently subject to study and prescription and treatment projects must incorporate such study findings. Mechanical work may be a primary method for treatment implementation. This area has also been identified by the Nelson CFRC, and by residents as a concern for local wildfire threat. The same WTA sites that were assessed in 2015 were revisited in 2022 and re-assessed - the hazard rating has not changed at

			fuel break, between continuous forested stands and the developed neighborhoods in and around Nelson. This site has several steep slope features, and areas of terrain stability concern that are currently subject to study.	those locations. This large proposed treatment area is intended for further refinement, and delineation based on a detailed site evaluation at the prescription stage. Conducting public outreach and engagement targeting property owners adjacent to this fuel break is recommended - since many of these residents have large lots, with possible accumulations of hazardous fuels between the property boundary and homes.
Grohman	High	27.52	This proposed treatment area is located adjacent to private properties in the rural area of Grohman Narrows. This area was first identified and assessed in the 2015 CWPP, and was deemed relevant to recommend again.	This area has been identified as a concern for local wildfire risk by all members of the CFRC. Because the approach to wildfire fuels management in Nelson has focussed on a collaborative approach, and sharing resources, this treatment unit is included as a mutually agreed upon priority of the RDCK, Ministry of Forests, and City of Nelson. This large proposed treatment area is intended for further refinement, and delineation based on a detailed site evaluation at the prescription stage.

Table 27: Vegetation management action items.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: reduce the potential wildfire intensity and ember exposure to people, infrastructure, structures, and other values through manipulation of both the natural and cultivated vegetation that is within or adjacent to a community.							
31	High	**Proceed with detailed assessment, prescription development, and treatment of fuel treatment units identified and prioritized in this CWRP.**	Treatment sites that fall outside of municipal boundaries will require coordination with Ministry of Forests Wildfire Risk Reduction staff to implement.	City of Nelson	7 years	Prescriptions written and implemented for all proposed treatment units.	Eligible for UBCM CRI funding.
32	Moderate	**As part of fuel treatment implementation, Nelson should develop interpretive signage to demonstrate pre- and post-fuel treatment forest stands conditions.**	Interpretive signage could include text explaining the purpose of the fuel management treatment, connection to the CWRP, and FireSmart practices residents nearby can take to reduce wildfire hazards around their yards and homes.	City of Nelson	5 years	Signage installed during implementation phases.	Eligible for UBCM CRI funding.
33	High	**When operational fuel treatments are conducted, re-assessment should occur 10 years after treatment by a qualified professional. This can be completed with a CWRP update or as a stand-alone exercise.**	A more specific date for reassessment could be identified when fuel management prescriptions for treatment of the recommended areas are developed. Re-assessment could also occur during the next iteration of the CWRP.	City of Nelson, consultant support	Ongoing	Monitoring scheduled and completed.	Eligible for UBCM CRI funding.

SECTION 6: APPENDICES

6.1 APPENDIX A: LOCAL WILDFIRE RISK PROCESS

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

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

The basis for the spatial analysis methodology is further detailed in Appendix A-2: Wildfire Threat Spatial Analysis Methodology. Wildfire Threat Assessment plot forms are provided in Appendix B: Wildfire Threat Assessment Plots – Worksheets and Photos (under separate cover).

6.1.1 APPENDIX A-1: FUEL TYPING METHODOLOGY

The Canadian Forest Fire Behaviour Prediction (FBP) System outlines five major fuel groups and sixteen fuel types based on characteristic fire behaviour under defined conditions.[26] Fuel typing is recognized as a blend of art and science. Although a subjective process, the most appropriate fuel type was assigned based on research, experience, and practical knowledge; this system has been used within BC, with continual improvement and refinement, for 20 years.[27]

There are significant limitations with the fuel typing system which should be recognized:

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

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

- The fuel typing system is designed to describe fuels which sometimes do not occur within the area of interest.
- Fuel types cannot fully, and accurately capture the natural variability within a polygon.
- The data used to create initial fuel types also has limitations.

Given these limitations, the following should be considered when using fuel type maps and information, to plan community wildfire resiliency projects:

- Fuel typing further from the developed areas of the study generally has a lower confidence.
- Fuel typing should be used as a starting point for more detailed assessments and as an indicator of overall wildfire risk, not as an operational, or site-level, assessment.
- Forested ecosystems are dynamic and change over time: fuels accumulate, stands fill in with regeneration, and forest health outbreaks occur.
- Regular monitoring of fuel types and wildfire risk assessment should occur every 5-10 years to determine the need for updated assessments.

Table 28 below summarizes the fuel types by general fire behaviour (crown fire and spotting potential). In general, the fuel type that may be considered most hazardous in terms of fire behaviour and spotting potential in the WUI is C-3. C-5 fuel types have a moderate potential for active crown fire when wind-driven.[28] An M-1/2 fuel type can sometimes be considered hazardous, depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory, as well as those in the understory. Regular monitoring of fuel types and wildfire risk assessment should occur every 5 – 10 years to determine the need for threat assessment updates and the timing for their implementation.

Table 28. Fuel type categories and crown fire spot potential. Only summaries of fuel types encountered within the WUI are provided – other fuel types, i.e., C-1, C-2, C-4, C-7, O-1 a/b, S-2, and S-3 are not summarized below.

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

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

Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels; areas harvested 10-20 years ago	Surface fire spread, torching of individual trees and intermittent crowning, (depending on slope and percent conifer)	<26% conifer (Very Low); 26-49% Conifer (Low); >50% Conifer (Moderate)
D-1/2	Aspen (leafless and green)	Deciduous stands	Always a surface fire, low to moderate rate of spread and fire intensity	Low
W	N/A	Water	N/A	N/A
N	N/A	Non-fuel: irrigated agricultural fields, golf courses, alpine areas void or nearly void of vegetation, urban or developed areas void or nearly void of forested vegetation	N/A	N/A
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels; areas harvested 10-20 years ago	Surface fire spread, torching of individual trees and intermittent crowning, (depending on slope and percent conifer)	<26% conifer (Very Low); 26-49% Conifer (Low); >50% Conifer (Moderate)

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

6.1.2 APPENDIX A-2: WILDFIRE THREAT SPATIAL ANALYSIS METHODOLOGY

Source Data

As part of the CWRP process, spatial data submissions are required to meet the defined standards in the Program and Application Guide. Proponents completing a CWRP can obtain open-source BC Wildfire datasets, including Provincial Strategic Threat Analysis (PSTA) datasets from the British Columbia Data Catalogue. Wildfire spatial datasets obtained through the BC Open Data Catalogue used in the development of the CWRP include, but are not limited to:

- PSTA Spotting Impact
- PSTA Fire Density
- PSTA Fire Threat Rating
- PSTA Lighting Fire Density
- PSTA Human Fire Density
- Head Fire Intensity
- WUI Human Interface Buffer (2Km buffer from structure point data)

- Wildland Urban Interface Risk Class
- Current Fire Polygons
- Current Fire Locations
- Historical Fire Perimeters
- Historical Fire Incident Locations
- Historical Fire Burn Severity
- Fuel Type

As part of the program, proponents completing a CWRP are provided with a supplementary Structure point dataset from BC Wildfire Services.

The provided PSTA data does not transfer directly into the geodatabase for submission, and several PSTA feature classes require extensive updating or correction. In addition, the Fire Threat determined in the PSTA is fundamentally different than the localized Fire Threat feature class that is included in the Local Fire Risk map required for project submission. The Fire Threat in the PSTA is based on provincial scale inputs - fire density, spotting impact; and head fire intensity; while the spatial submission Fire Threat is based on the components of the Wildland Urban Interface Threat Assessment Worksheet.

Spatial Analysis

Not all attributes on the WUI Threat Assessment form can be determined using a GIS analysis on a landscape/polygon level. To emulate as closely as possible the threat categorization that would be determined using the Threat Assessment form, the variables in Table 29 were used as the basis for building the analytical model. The features chosen are those that are spatially explicit, available from existing and reliable spatial data or field data, and able to be confidently extrapolated to large polygons.

Table 29. Description of variables used in spatial analysis for WUI wildfire risk assessment

WUI Threat Sheet Attribute	Used in Analysis?	Comment
Fuel Subcomponent		
Duff depth and Moisture Regime	No	Many of these attributes assumed by using 'fuel type' as a component of the Fire Threat analysis. Most of these components are not easily extrapolated to a landscape or polygon scale, or the data available to estimate over large areas (VRI) is unreliable.
Surface Fuel continuity	No	
Vegetation Fuel Composition	No	
Fine Woody Debris Continuity	No	
	No	
Live and Dead Coniferous Crown Closure	No	
Live and Dead Conifer Crown Base height	No	
Live and Dead suppressed and Understory Conifers	No	
Forest health	No	
Continuous forest/slash cover within 2 km	No	
Weather Subcomponent		
BEC zone	Yes	Although included, these are broad classifications, meaning most polygons in the Study Area will have the same value
Historical weather fire occurrence	Yes	

WUI Threat Sheet Attribute	Used in Analysis?	Comment
Topography Subcomponent		
Aspect	Yes	
Slope	Yes	Elevation model was used to determine slope.
Terrain	No	
Landscape/ topographic limitations to wildfire spread	No	
Structural Subcomponent		
Position of structure/ community on slope	No	Too difficult to quantify – this is a relative value.
Type of development	No	Too difficult to analyze spatially.
Position of assessment area relative to values	Yes	Only distance to structures is used in this analysis, being above, below or sidehill too difficult to analyze spatially.

The other components are developed using spatial data (BEC zone, fire history zone) or spatial analysis (aspect, slope). A scoring system was developed to categorize resultant polygons as having relatively low, moderate, high or extreme Fire Threat, or Low, Moderate, High or Extreme wildfire threat class. Table 30 below summarizes the components and scores to determine the Fire Threat.

Table 30. Fire Threat Class scoring components

Attribute	Indicator	Score
Fuel Type	C-1	35
	C-2	
	C-3	
	C-4	
	M-3/4,>50% dead fir	
	C-6	25
	M-1/2, >75% conifer	20
	C-7	
	M-3/4, <50% dead fir	
	M-1/2, 50-75% conifer	15
	M-1/2, 25-50% conifer	10
	C-5	
	O-1a/b	
	S-1	
	S-2	
	S-3	
	M-1/2, <25% conifer	5
	D-1/2	0
	W	0
	N	0
Weather - BEC Zone	AT, irrigated	1

Attribute	Indicator	Score
	CWH, CDF, MH	3
	ICH, SBS, ESSF	7
	IDF, MS, SBPS, CWHsds1 & ds2, BWBS, SWB	10
	PP, BG	15
Historical Fire Occurrence Zone	G5, R1, R2, G6, V5, R9, V9, V3, R5, R8, V7	1
	G3, G8, R3, R4, V6, G1, G9, V8	5
	G7, C5, G4, C4, V1, C1, N6	8
	K1, K5, K3, C2, C3, N5, K6, N4, K7, N2	10
	N7, K4	15
Slope	<16	1
	16-29 (max N slopes)	5
	30-44	10
	45-54	12
	>55	15
Aspect (>15% slope)	North	0
	East	5
	<16% slope, all aspect	10
	West	12
	South	15

Limitations

There are obvious limitations in this method, most notably that not all components of the threat assessment worksheet are scalable to a GIS model, generalizing the Fire Behaviour Threat score. The Wildfire Threat Score is greatly simplified, as determining the position of structures on a slope, the type of development and the relative position are difficult in an automated GIS process. Structures are considered, but there is no consideration for structure type (also not included on threat assessment worksheet). This method uses the best available information to produce accurate and useable threat assessment across the study area in a format which is required by the UBCM CRI program.

6.1.3 APPENDIX A-3: WUI RISK SPATIAL ANALYSIS METHODOLOGY

To determine the WUI Risk score, only the distance to structures is used. Buffer distance classes are determined; <200m, 200m-500m and >500m) but only for polygons that had a 'high' or 'extreme' Fire Threat score from previous assessment. To determine WUI Risk; those aforementioned polygons within 200m are rated as 'extreme', within 500m are rated as 'high', within 2km are 'moderate', and distances over that are rated 'low'. WUI Risk Classes and associated assumed scores are summer below in Table 31.

Table 31. WUI Risk Classes and their associated summed scores

WUI Risk Class	Score

Very Low	0
Low	0-35
Moderate	35-55
High[29]	55-65
Extreme	>65

6.1.4 APPENDIX A-4: PROXIMITY OF FUEL TO THE COMMUNITY

Home and Critical Infrastructure Ignition Zones

Multiple studies have shown that the principal factors that contribute to structure loss by wildfire are the structure's characteristics and immediate surroundings. The area that determines the ignition potential of a structure is referred to (for residences) as the Home Ignition Zone or (for critical infrastructure) the Critical Infrastructure Ignition Zone.[30,31] Both the Home Ignition Zone and Critical Infrastructure Ignition Zone include the structure itself and four concentric, progressively wider zones out to 30 m from the structure (Figure 3 below). More details on can be found in the FireSmart Manual.[32]

Figure 3. Illustration of the three priority areas that make up the Home Ignition Zone.

During extreme wildfire events, most home destruction results from low-intensity surface fires, usually ignited by embers. Embers can be transported long distances ahead of the wildfire, across fire guards and

[29] WUI risk is only assessed for polygons with wildfire threat ratings of high or extreme.

[30] Reinhardt, E., R. Keane, D. Calkin, J. Cohen. (2008). *Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States*. Forest Ecology and Management 256:1997 - 2006.

[31] Cohen, J. *Preventing Disaster Home Ignitability in the Wildland-urban Interface*. Journal of Forestry. p 15 - 21.

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

fuel breaks, and accumulate within the Home Ignition Zone or Critical Infrastructure Ignition Zone in densities that can exceed 600 embers per square meter. Combustible materials found within the Home Ignition Zones or Critical Infrastructure Ignition Zones can create fire 'pathways', allowing surface fires ignited by embers to spread and carry flames into contact with structures.

Because ignitability of the Home Ignition Zone or Critical Infrastructure Ignition Zone is the main factor driving structure loss, the intensity and rate of spread of wildfires beyond the community does not always correspond to a high potential of loss or damage. For example, FireSmart homes with low ignitability may survive high-intensity fires, whereas highly ignitable homes may be destroyed during lower intensity surface fire events.[31] Extreme wildfire conditions do not necessarily result in WUI fire disasters.[33] It is for this reason that the key to reducing WUI fire structure loss is to reduce structure ignitability. Mitigation responsibility must be centered on structure owners. Risk communication, education on the range of available activities, and prioritization of activities should help homeowners to feel empowered to complete simple risk reduction activities on their property.

Community Zone

The Community Zone encompasses all non-Provincial Crown public land within the municipal boundary, that is beyond 30 m from private structures.[34] Vegetation management planning and implementation on most Community Zone lands should be directed through a formal fuel management prescription developed by a forest professional with wildfire vegetation management within their scope of practice[34]. Depending on the results of FireSmart Structure Ignition Zone assessments on individual structures, vegetation management may be required beyond 30 meters and up to 100 meters (FireSmart Extended Zone) on larger private parcels.[18] Municipal parks, trails, and outdoor event spaces are all part of the Community Zone. Often Community Zone lands see high use by the public, which increases accidental ignition potential and risk to properties surrounding them.

Landscape Zone

The Landscape Zone encompasses provincial Crown lands that are located outside the municipal boundary. Vegetation (fuel) management planning and implementation is primarily the responsibility of the provincial government, working collaboratively to align landscape objectives with the CWRP objectives[34]. Vegetation management planning and implementation in the Landscape Zone and on all forested provincial Crown lands must be directed through a formal fuel management prescription developed by a forest professional with wildfire vegetation management within their scope of practice.[34]

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

[34] Community Resiliency Investment. (2021). *FireSmart Community Funding and Supports Supplemental Instruction Guide.* Retrieved from: https://www.ubcm.ca/funding-programs/local-government-program-services/community-resiliency-investment/firesmart-0

Fire hazard in the WUI is partly dictated by the proximity of fuel to developed areas. Fuels closest to the community pose a higher hazard, compared to fuels that are further from values at risk. It is recommended that fuels closest to structures or developed areas are prioritized for treatment first, in order to reduce the risk closest to the community. Continuity of fuel treatment is an important consideration, which can be ensured by reducing fuels from the edge of the community outward. Table 32 describes the classes associated with proximity of fuels to the interface.

Table 32. Proximity to the Interface.

Proximity to the Interface	Descriptor*	Explanation
WUI 100 *HIZ/CIIZ and Community Zones*	(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 *Community and Landscape Zones*	(100-500m)	Treatment would affect wildfire behaviour approaching a value, as well as the wildfire's ability to impact the value with short- to medium- range spotting; should also provide suppression opportunities near a value.
WUI 1000 *Landscape Zone*	(500-1000 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.
Landscape Zone	>1000 m	This should form part of a landscape assessment and is generally not part of the zoning process. Treatment is relatively ineffective for threat mitigation to a value, unless used to form a part of a larger fuel break / treatment.

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

6.1.5 APPENDIX A-5: FIRE SPREAD PATTERNS

ISI roses can help plan the location of fuel treatments on the landscape to protect values at risk based on the predominant wind direction and frequency of higher ISI values. Potential treatment areas were identified and prioritized with the predominant wind direction in mind. Figure 4 below displays the daily average ISI values for the Smallwood fire weather station, which represents wind speeds and directions in the southeast of the WUI.

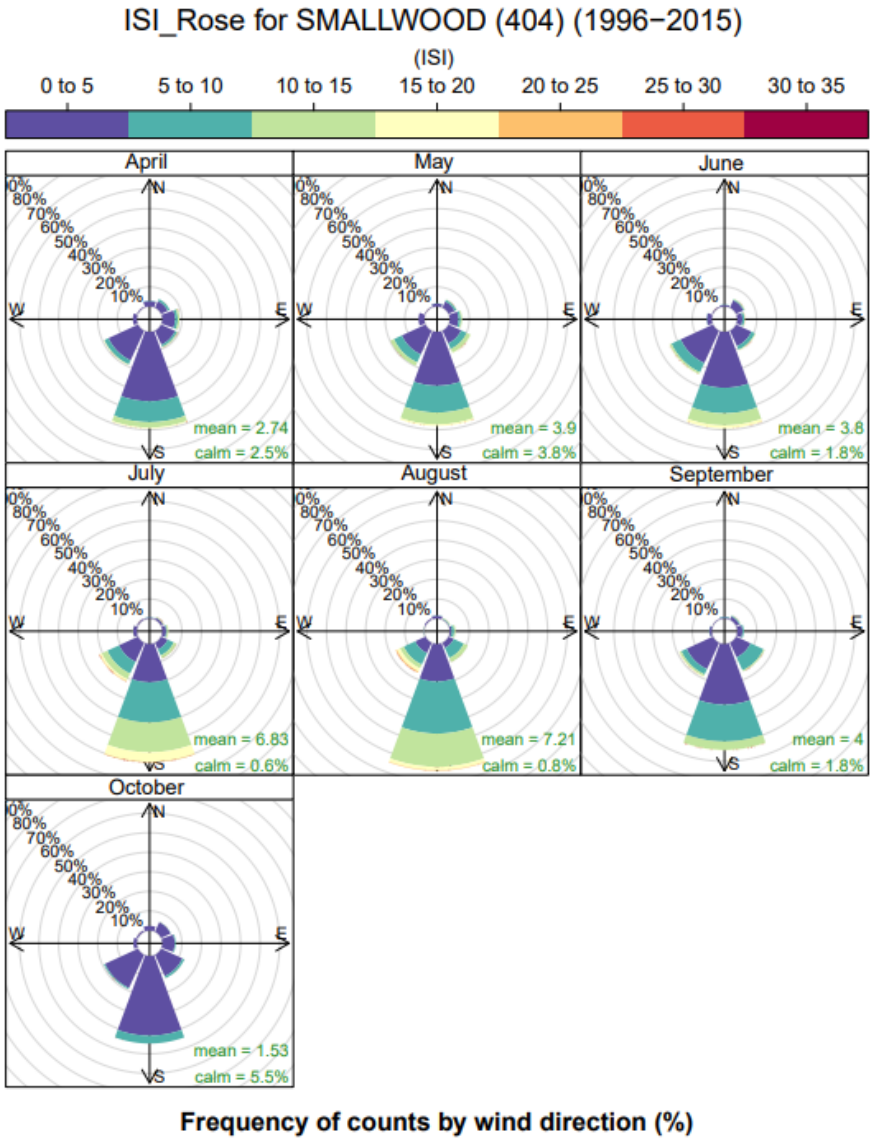

Figure 4. Initial Spread Index (ISI) roses depicting average daily wind speed and direction for each month during the fire season (April – October). Data taken from the Smallwood fire weather station.

6.2 APPENDIX B: WILDFIRE THREAT ASSESSMENT PLOTS – WORKSHEETS AND PHOTOS

Provided separately as PDF package.

6.3 APPENDIX C: MAPS

Provided separately as PDF package.