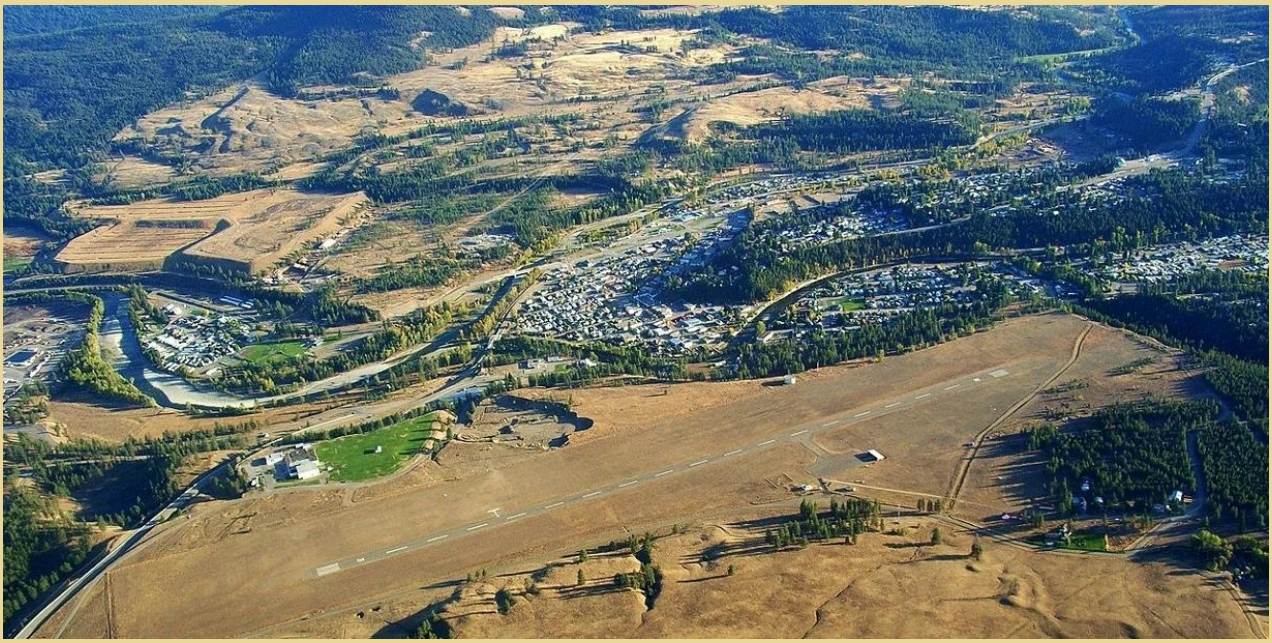

Town of Princeton

June 15, 2021

DRAFT

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Town of PRINCETON
Where Rivers and Friends Meet

SIGNATURES

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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 (CRI) 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 Town of Princeton's (Princeton) 2006 CWPP. The area of interest (AOI) for this plan is the Princeton Volunteer Fire Brigade's (Princeton FD) fire protection area, which stretches north, east, and south from the town centre and out of the municipal boundary. The CWRP provides Princeton with an updated action plan that can be used to guide the improvement and/or development of emergency plans, emergency response, evacuation plans, communication and education programs, bylaw development in areas of fire risk, and the management of potentially hazardous forest and grass lands for the AOI's eligible Wildland Urban Interface (WUI).

A total of 48 recommendation and action items are presented in a tabularized format (Table 1) within this Executive Summary and are more thoroughly discussed in their appropriate sections within the document. Because the WUI extends outside Princeton's municipal boundary onto private land and other jurisdictions, Princeton's role may be limited to one of influencer 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 Princeton's WUI. Princeton will have to further prioritize implementation based on resources, strengths, constraints, and availability of funding, and regularly update the prioritization and course of action as variables change through time.

FireSmart activities on private property and critical infrastructure (with a focus on a values-out approach, *i.e.,* starting with activities on the structure itself and then the surrounding area immediately adjacent and continuing outwards) were the number one recommendation provided by BC Wildfire Service during development of this plan. 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 home and property owners to feel empowered to complete simple risk reduction activities on their property.

Field work allowed for verified and updated fuel types (Appendix A-1: Fire Risk Threat Assessment Methodology, Map 4) and wildfire threat assessments to be combined with an office-based analysis to update the local wildfire threat for Princeton'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 *38% of Princeton's WUI has a moderate wildfire behavior threat or higher*, *with high and extreme threat classes constituting 19% of that*. This, along with other analyses presented and discussed throughout the document, show that wildfire is a real threat to Princeton and its WUI. Princeton has begun planning and preparing for a wildfire emergency through available FireSmart resources but should look to this CWRP on how to continue this process effectively.

Table 1: Princeton's CWRP Action Plan

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
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	High	Princeton and/or Local FireSmart Representatives should support and facilitate priority neighborhoods to self-organize to attain FireSmart Canada Neighbourhood Recognition Program (FSCNRP) status.	Leverage the leadership of a Local FireSmart Representative. Consider utilizing the local FireSmart rebate program or neighbourhood chipping opportunities (Section 5.7) as incentives.	Princeton (Local FireSmart Representatives)	5 years	Completed for priority neighbourhoods 1,2, and 3.	UBCM CRI funding available ($5000/ neighbourhood; 40 hours/ initiative)
2	High	Princeton should develop a FireSmart/Wildfire Preparedness page on Princeton's website (with a direct link from the opening webpage). Include links to FireSmart BC and other relevant wildfire resources. Promote this webpage through different media sources, including The Similkameen Spotlight newspaper.	Princeton's webpage already has a front-page button/link to fire bans. Amalgamate with a FireSmart link or place them side-by-side.	Princeton (Consultant)	1 year	Webpage updated	UBCM CRI funding available (~40 hours for set-up. Additional hours for updates as required)
3	High	Princeton, Princeton FD, and Local FireSmart Representatives should continue to promote FireSmart approaches for wildfire risk reduction to homeowners, businesses, and stakeholders within the Princeton FD FPA through FireSmart workshops, open houses, and/or presentations (*i.e.,* Wildfire Community Preparedness Day, Neighbourhood Champion Workshop), Farm and Ranch Wildfire Preparedness Workshop). Supply FireSmart resources during these engagement campaigns and promote the FireSmart Begins at Home mobile app as a method of conducting home assessments.	Aim to conduct the engagement and promotion campaign prior to and during the fire season. Include education specific to the Princeton community such as, emphasizing the importance of visible addresses and widened driveways for emergency response, safe debris removal methods, and FireSmart firewood storage. Provide information on FireSmart landscaping and exterior residential sprinklers as FireSmart prevention measures.	Princeton (Princeton FD, Local FireSmart Representatives, Community Champions)	Yearly (pre-fire season)	50 participants per year	UBCM CRI funding available (~40 hours for planning and 1 day for workshop)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
			Princeton had received 2020 funding from UBCM CRI for workshops, but these were cancelled due to COVID restrictions. Consider moving workshops online as a work-around.				
4	Moderate	Princeton should encourage School District 58 to adopt and deploy existing wildfire education programs. Other options/value-added activities include consulting with Association of BC Forest Professionals (ABCFP) and BCWS (Kamloops Fire Centre) as well as the local fire department and regional FireSmart representatives to facilitate and recruit volunteer teachers and experts to help with curriculum development to be delivered in the schools (field trips, guest speakers, etc.).	Emergency preparedness curriculum is available provincially, which includes preparedness for a variety of natural hazards, including wildfire (Master of Disaster, FireSmart BC Education box).	Princeton	Yearly (pre-fire season)	One FireSmart education day per school year	UBCM CRI funding available (FireSmart BC Education box - $800 Junior K- Grade 12)
5	High	This CWRP report and associated maps should be made publicly available by Princeton through its website and on social media. In addition, this CWRP should be shared with local industry partners who may be interested in collaborating on FireSmart and wildfire risk reduction activities.	Include all member of the CFRC, as well as other relevant industry and businesses in the WUI (*i.e.,* Weyerhaeuser mill operations manager).	Princeton	1 year	Available for download or viewing on Princeton's webpage	Princeton
6	Medium	Additional signage of danger class rating, fire bans, and general fire safety related warnings should be posted as required in the WUI. Signs should be updated at least weekly during the fire season by a Princeton FD member or designate.	Tourism to Princeton and the surrounding region is at its peak during the fire season. It is important to ensure residents, vacation property owners, and visitors understand current fire bans and Danger Class Ratings.	Princeton (RDOS)	Yearly (on-going)	Current and accurate fire danger ratings posted on signs	Princeton and RDOS. (~$500/sign)
7	High	Apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. The rebate program is described in detail in the CRI Program 2020 FireSmart Community Funding and Supports – Program & Application Guide and must adhere to the goals and objectives of	Incentivize homeowners to FireSmart activities on their properties by allowing them to access partial rebates for, if rated as high or extreme risk in a FireSmart home assessment.	Princeton	2 years	Rebate program established and made known to residents in priority	UBCM CRI funding available (~20-30 hours in-house)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
		FireSmart. Before applying for funding, Princeton's resources available to execute the program should be reviewed. An LFR could be engaged to support the program.				neighbourhoods (Table 17).	
8	High	FireSmart Canada is releasing BC specific landscaping guidelines in 2021. When available, make these guidelines available on the Princeton FireSmart webpage and hand out pamphlets/literature relating to it to residents.	Increase FireSmart vegetation management knowledge amongst Princeton's residents.	Princeton (Local FireSmart Representatives, Community Champions)	1 year from when the guidelines are made available	Posted on Princeton's FireSmart webpage and handed out in priority neighbourhoods (Table 17)	UBCM CRI funding available (~ 20 hours in-house; no cost)
9	High	Provide outreach materials to encourage homeowners to complete a FireSmart home assessment using the Home Assessment guide or the FireSmart Begins at Home mobile app, though a Local FireSmart representative, or through the FireSmart Home Partners Program.	Educate homeowners on FireSmart principles and encourage residents to FireSmart their homes.	Local FireSmart Representative (Mitigation Specialist, Community Champions)	2 years	Home assessments started within priority neighbourhoods (Table 17)	UBCM CRI funding available for LFR training and employment and public education materials
Legislation and Planning (Section 5.2)							
Objective: provide the means for Princeton to implement wildfire risk reduction actions through by-laws and legislation by outlining local government responsibilities regarding wildfire.							
10	High	Complete or schedule periodic updates of the CWRP. The frequency of updates is highly dependent upon major changes which would impact local wildfire risk, or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWRP update should be initiated every 5 years.	A current (i.e., no more than 5 years old) CWRP is currently a requirement for further funding under the CRI Program.	Princeton (Consultant)	5-7 years from adopting this CWRP document	Princeton always has an up-to-date CWRP and action plan	UBCM CRI funding available (~$25,000 for full document / $10,000 for update)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
11	High	Update Bylaw 393, 1982 (Prohibit the Fouling or Contamination of the Atmosphere Bylaw) to include approved activities related to wildfire vegetation management and wildfire risk reduction.	Allows for prescribed burns and fuel treatments to be administered without contradicting the bylaw.	Princeton	2 years	Bylaw updated	UBCM CRI funding available (~20 hours in-house)
Development Considerations (Section 5.3)							
Objective: embed FireSmart practices and considerations into all development within Princeton							
12	High	Develop a wildfire hazard DPA and update Princeton's Official Community Plan (OCP) with respect to it when completed. To meet objectives, consider including the following elements: • minimum setbacks from forested edges based on FireSmart, • fuel management based upon qualified professional recommendations, • landscaping to FireSmart guidelines, • building materials and design based on NFPA 1144 and FireSmart standards, • underground servicing, • prompt removal of combustible construction materials or thinning/fuel management waste, and • a minimum of two access/evacuation routes for all neighbourhoods.	Embed FireSmart values into all aspects of community development and planning.	Princeton (Consultant)	5 years	Interface wildfire DPA created and adopted	UBCM CRI funding available (~25,000 and 40 hours in-house)
13	Moderate	OCP: amend section *11.1.9 (.1–.5) Policies to Engage and Protect the Community – General*: *Fire Hazards* to include the potential impact wildfire may have on public health and safety, ecosystems, habitat, and water quality among other values.	Embed community FireSmart values in the OCP to guide future development. See the Fraser Valley Regional District	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available (~$10,000 and 20 hours in-house)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
			Electoral Area D OCP Update,[1] the Cariboo Regional District Electoral Area G OCP[2] and other regional district electoral areas as examples.				
14	High	OCP: amend section *5.2.2 Land Use Policies – General Residential* to include a review of hydrant and water access by the Princeton FD and that two points of access/egress be included in all new developments.	Include language specifying what constitutes acceptable access for firefighting vehicles and to include a fire access route "that has been inspected or approved by the local fire department (or other applicable professional)."	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available (~$10,000 and 20 hours in-house)
15	High	OCP: amend *section 5.10.5 Land Use Policies – Industrial* to include FireSmart landscaping as part of, "appropriate buffering and screening through landscaping such as tree retention, supplementary planting…."	Add reference to FireSmart landscaping guidelines/standards, the Home Ignition Zone, and the Critical Infrastructure Ignition Zone.	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available (~$10,000 and 20 hours in-house)
16	High	OCP: amend section *5.10.11 Land Use Policies – Industrial* to include FireSmart principles (vegetation, landscaping) as part of, "restoring the landscape upon completion of the operations."	Add reference to FireSmart landscaping guidelines/standards, the Home Ignition Zone, and the Critical Infrastructure Ignition Zone. Recommendation #25 applies to this on all Crown lands.	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available (~$10,000 and 20 hours in-house)
17	High	OCP: amend section *7.1 (.1 - 5, .6) Visual Quality and Aesthetics Policies – General* and section *8.1 (.1-.5) Healthy and Active Living Policies –Parks* to consider park, public space, and trail	Trail building and maintenance and park and open space maintenance activities can either increase wildfire risk (through fuels accumulations and	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available

[1] Fraser Valley Regional District. 2018. *Official Community Plan for Popkum-Bridal Fall Bylaw No. 1502, 2018*. Retrieved from: https://www.fvrd.ca/assets/Services/Documents/Planning~and~Development/Projects~and~Plans/Popkum~Bridal~Falls~OCP~Update/Area%20D%20Bylaw%201501%202nd%20Reading.pdf

[2] Cariboo Regional District. 2018. *Lac La Hache Area Official Community Plan Bylaw No. 5170*. Retrieved from: https://www.cariboord.ca/en/business-and-development/resources/Documents/PlanningandDevelopment/OCP/LacLaHacheAreaOCP/Lac_La_Hache_Area_OCP.pdf

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
		acquisition and maintenance through a wildfire lens. This will help ensure wildfire risk, mitigation, liability, and future maintenance are considered as priorities in development of the parks and trails inventory, including consideration for long-term maintenance costs and access. Include the requirement for a qualified professional to review and assess the siting of parks and park access prior to acceptance into Princeton's Park inventory.	unsafe work practices) or decrease wildfire risk (through proper placement, emergency access and evacuation, clean-up of combustible fuels trailside, and work practices).				(~$10,000 and 20 hours in-house)
18	Moderate	Existing single access neighbourhoods should be reassessed for potential secondary access/evacuation routes. There could be opportunities for an easement or agreement-on-use on the edge of an individual's private property for a single lane gravel road that could create the required secondary evacuation route for a neighbourhood (to be used only in emergency evacuation situations).	It is recognized that most of these neighbourhoods are older and surrounding private property can make this difficult. Opportunities are possible by contacting BC Hydro/Fortis BC and discuss using parts of the existing right-of-way access roads or forest land managers and using resource roads as emergency evacuation routes.	Princeton (Consultant)	5 years	Where determined possible, secondary egress routes are being planned for development	Princeton ($ variable: location specific)
19	High	Engage a qualified professional (such as a Local FireSmart Representative) to complete formal FireSmart assessments of critical infrastructure. Plan and implement action items in sequence of CI importance.	CI such as fire halls, emergency shelters, and water infrastructure are identified in Table 8.	Princeton (Local FireSmart Representative)	2 years	Assessments completed and action items being planned for	UBCM CRI funding available (~$1000 per CI)
20	High	Use fire-resistant construction materials, building design and landscaping for all CI when completing upgrades or establishing new infrastructure.	Vegetation setbacks around CI should be compliant with FireSmart principles (*e.g.,* no combustible material within 10 m of structures).	Princeton	Ongoing	New CI are FireSmart	Princeton ($ variable: CI specific)
21	High	Develop a landscaping standard which lists flammable, non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements; to avoid wildlife attractants, and to reduce wildfire hazard.	Consider including the landscaping standard as part of the wildfire hazard DPA, as well as making it publicly available for residents and homeowners outside of the DPA. *FireSmart Canada is releasing BC specific landscaping guidelines in 2021*	Princeton	3 years	Landscaping standard created (or adopted) and built into the interface wildfire DPA	Princeton; UBCM CRI funding available ($0 if using FireSmart

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
			that can be used instead of creating Princeton-specific ones.				Canada guidelines; ~20 hours in-house)
22	High	All new developments outside of existing water service areas should have a water system which meets or exceeds minimum standards of NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting.	Princeton FD should also review the planned water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs.	Princeton	Ongoing	New development water standards meet NFPA 1142 Standard on Water Supplies for Suburban and Rural Fire Fighting.	Princeton ($ variable: location specific)
23	Moderate	Princeton should conduct a water supply vulnerability assessment to determine potential supply issues.	This assessment could include an analysis of the vulnerability of water supply infrastructure to wildfire and/or mass wasting events.	Princeton (Consultant)	5 years	Assessment completed	UBCM CRI funding available ($2000 for assessment)
24	High	Explore opportunities to enhance water access/drafting sites for Princeton FD (and wildland firefighters) in the FD's rural fire protection areas. Opportunities include building permanent cisterns on the edge/near known accessible drafting sites that are gravity fed and covered to reduce evaporation during fire season.	This will likely involve multiple jurisdictions and entities including Princeton FD, BCWS, RDOS, FLNRORD and multiple professional assessments (engineering, riparian, biology)	Princeton (BCWS, RDOS, FLNRORD, Consultant)	5 years	New drafting sites located	Princeton (no estimate)
Interagency Cooperation (Section 5.4)							
Objective: broaden from department or agency siloes and a single jurisdiction-based approach to a risk driven, multi-agency and multi-scalable approach.							
25	High	Engage and work with surrounding forest licensees (Vermillion Forks Community Forest, Woodlots 0350, 1861, 1446, and 0393, Weyerhaeuser, etc.) to: 1) Consider developing a rationale for reduced stocking standards applicable to surrounding	1) Reduce interface wildfire risk throughout managed forest lands that	1) Princeton	5 years	1) Interface wildfire stocking standard created,	

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
		forest licensees by employing a qualified wildfire management professional, and in consultation with the Fuel Management Specialist (Kamloops Fire Centre) and MFLNRORD. This can be attained by adding fire management stocking standards to their respective forest stewardship plans / license plans / woodlot management plans and to consider applying them in portions of the wildland urban interface. 2) Ensure that high risk activities, such as vegetation management, pile burning, and harvesting do not occur during high/extreme fire danger times. Lobby for adequate fire suppression tools (as per the Wildfire Act and regulations) being on-site during high-risk activities.	are closest to structures in the WUI. Weyerhaeuser does not currently have any developed but is open to developing and applying fire management stocking standards where appropriate (they also manage the Vermillion Forks Community Forest). Some MFLNRORD Natural Resource Districts have already developed fire management stocking standards that could be applied. 2) Reduce chance of ignitions as per the *Wildfire Act* and reduce spread potential during an ignition event.	(FLNRORD, Stakeholders, Consultant) 2) Stakeholders		approved, and implemented 2) High-risk activities not conducted during high/extreme fire danger	1) UBCM CRI funding available (~$5,000 and ~60 hours in-house) 2) Cost of equipment paid by stakeholder
26	High	Continue to promote right-of-way best management practices (BMPs) for regular brushing and clearing of woody debris and shrubs in coordination with FortisBC and BC Hydro to help reduce fire risk, utility pole damage, and subsequent outages. In addition, FortisBC, BC Hydro, and the Ministry of Transportation and Infrastructure should ensure rights-of-way do not contain fine fuel accumulations (< 7.5 cm, easily cured) and significant regeneration of conifer vegetation prior to and during the fire season and are maintained in a low hazard state.	Tree failures adjacent to power lines (transmission and distribution) are common occurrences and represent significant risks to ignition within the WUI. Encroachment of understory vegetation and overhanging trees were noted by consultants in various locations throughout the WUI.	Princeton (BC Hydro, FortisBC)	5 years	BMPs in use for the region	(~30 hours in-house)
27	High	Lobby private Critical Infrastructure owner/operators to complete FireSmart Critical Infrastructure Assessments and plan mitigation works as a result of those assessments.	Creates opportunities for joint-applied/funded CRI and WRR activities. Princeton could offer the time of its own Local FireSmart Representatives to carry out the assessments.	Princeton	Within 3 years	All privately owned CI are assessed	Private (~$500 per structure)

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28	High	Continue to participate in RDOS CFRC meetings.	Creates opportunities for joint-applied/funded CRI and WRR activities across jurisdictions.	Princeton	Ongoing	Continued participation	Princeton (no cost)
29	High	Plan Princeton CFRC scheduled meetings, especially prior to and during fire season.	Continued communication and planning across local stakeholders contribute to wildfire preparedness.	Princeton CFCR	Ongoing	Scheduled meetings	Princeton (no cost)
30	High	Continue to have relevant local government and Princeton FD members attend annual FireSmart BC conferences, hosted by the BC FireSmart Committee.	Participation will continue to foster a strong relationship between Princeton and FireSmart BC/Canada.	Princeton	Ongoing	1 local gov. and 1 FD member each year	UBCM CRI funding available ($ dependent on location and travel distances)
Cross-Training (Section 5.5)							
Objective: support the development of comprehensive and effective wildfire risk reduction planning and activities, as well as a safe and effective response.							
31	High	Ensure all fire personnel attain/continue to maintain their SPP-WFF1 certification at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires (i.e., SPP-115). Princeton FD should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources/budgets allow.	Ensure all Princeton FD personnel are qualified to respond to wildfire emergencies and use wildfire suppression equipment. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the application of structural protection units (SPUs).	Princeton FD	Ongoing	FD members training is encompassing and continually updated	Princeton ($/time dependent on training done)
32	High	Princeton should facilitate FireSmart Home Partners Mitigation Specialist Training and additional Local FireSmart Representative (LFR) Training opportunities for applicable Princeton FD and government emergency management personnel.	Increase Princeton's capabilities to provide FireSmart programs and resources to the community.	Princeton (Princeton FD)	Ongoing	2 additional Mitigation Specialists 2 additional LFRs	UBCM CRI program funding available ($/time dependent on training done)
33	High	Princeton should leverage Local FireSmart Representatives (LFR) to:	Increase Princeton's FireSmart priority neighbourhoods' capabilities to assume	Local FireSmart Representative		Community champion	

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
		1) conduct outreach into priority FireSmart Neighbourhoods to identify potential community champions, and 2) schedule and conduct FireSmart Community Champion Training.	FireSmart planning and mitigation activities themselves.		1) 2 years 2) 2-4 years	identified for each high risk FireSmart neighbourhood (Table 17)	1) ($/ time dependent) 2) UBCM CRI funding available
34	High	Princeton FD (with support from BCWS) should reach out to RockRidge Canyon and other fire protection area communities and stakeholders to: 1) plan and conduct S-100 training, and 2) assess and provide recommendations towards increasing wildfire fighting capabilities.	Increase the wildfire emergency preparedness of Princeton FD's fire protection area communities and stakeholders and their ability to protect themselves from wildfire.	Princeton FD (BCWS)	2 years, then ongoing	Princeton FD FPA has persons trained in S-100 and some basic wildfire fighting equipment available	UBCM CRI funding available for wildfire courses
Emergency Planning (Section 5.6)							
Objective: 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 provide improving Princeton's ability to respond to (during and after) a wildfire emergency.							
35	High	Princeton FD should continue engaging BCWS to conduct annual reviews ensuring PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use.	Maintain an annual structural and interface training and equipment review program and maintain a strong relationship between Princeton FD and BCWS.	Princeton FD (BCWS)	Yearly (pre-fire season)	Wildland firefighting equipment resources are complete	(no cost; ~10 hours in-house)
36	High	Conduct yearly (pre-fire season is best) response exercises with RockRidge Canyon and other Princeton FD fire protection area contract holders. Identify hazards, barriers to access (i.e., locked gates, tight or no turnarounds), and other response issues and develop measures to address them.	Maintain and grow knowledge of fire protection area communities and stakeholders and create a strong relationship between Princeton FD and them.	Princeton FD (BCWS, RockRidge Canyon)	Yearly (pre-fire season)	Response exercises conducted at least once every two years	Princeton (~12 hours in-house per exercise)
37	High	Complete and participate in regular testing of, and updates to, the Evacuation Plan for Princeton.	Identify any challenges with the Evacuation Plan before it is deployed in a real emergency.	Princeton (Princeton FD, Emergency	Yearly	Testing conducted at least once every two years	Princeton (~12 hours in-house per test exercise)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
				Management Services)			
38	Moderate	Develop an Evacuation Plan pamphlet that summarizes key components of the Evacuation Plan, specific to resident roles during an evacuation event. The pamphlet should be made available online and could be available as a hard copy at general stores.	Pamphlets are an effective public communication tool.	Princeton	2 years	Pamphlets created and available to the public	Princeton (~$5.00/ pamphlet; 10 hours in-house)
39	Moderate	Update Princeton's HRVA and emergency management plan with information and data from this CWRP. Develop wildfire specific incident plans and associated maps. Incorporate items listed in the Pre-Incident Planning subsection above. Local Fire Threat and stakeholders/tenure holders contact information should be incorporated within the map. The map should be included in the Princeton Evacuation Plan and shared with fire suppression personnel, BCWS, and industrial operators (Weyerhaeuser, Woodlots, Community Forest) to support emergency response in the event of a wildfire. The map should be reviewed as needed to incorporate additions and/or changes.	Wildfire incident plans and maps will support emergency response in the event of a wildfire and/or evacuation event. These plans help target emergency planning and effort in meaningful and effective ways, such as knowing where fire guards can/can't be built, as well as minimizing the need for using machinery to build cat guards in sensitive areas.	Princeton (Consultant, BCWS, RDOS)	5 years	Wildfire incident plans and associated maps created and made available	Princeton (~80 hours consultant and in-house hours)
40	High	Princeton's firehall, municipal hall, sewer stations, and water pumps/wells do not have backup gas- or diesel-powered generators. Princeton should invest in secondary power sources to continue these services in the case of prolonged or extensive power outage. Upgrade or realign resources, as prioritized.	Ensure that both the Princeton FD Fire Hall and all ESS facilities have back-up gas or diesel generators with sufficient fuel supply for extensive power outages (3 + days) so that they can function as reception centers/department operation centers as required in the event of an emergency	Princeton	5 years	All CI have back-up power sources	Princeton ($ dependent on requirements)
41	High	Princeton should apply for UBCM CRI funding to hire a FireSmart coordinator (full or part-time basis).	To manage the planning and implementation of recommendations and action items in this report. Explore 'sharing' a part-time position with one	Princeton	1 year	FireSmart coordinator hired	UBCM CRI funding available

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
			or more adjacent municipalities, creating one full time job.				($14,000 contract pay)
42	Moderate	Princeton should develop an outreach document that outlines emergency fuel/propane emergency shut off best-practices for facilities with hazardous infrastructure (e.g., gas stations, ice hockey arenas, mills) to enact in the event of an approaching wildfire or ember shower. Consider contacting the Emergency Management BC Regional Office for guidance.	Provide facilities with hazardous infrastructure with resources/procedures to reduce hazard during a wildfire event.	Princeton	5 years	Document created and made available to hazardous infrastructure owners and operators	UBCM CRI funding available (~40 hours in-house)
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.							
43	High	Proceed with detailed assessment, prescription development and treatment of fuel treatment units identified and prioritized in this CWRP.	To reduce wildfire hazard in priority treatment units.	Princeton (Consultant)	3 years	Prescriptions for high priority units developed, prioritizing HIZ/CIIZ and Community Zone FTUs	UBCM CRI funding available (~$500/ha prescription; ~$7500/ha treatment)
44	High	As part of fuel treatment implementation on Princeton municipal land (high public use areas such as next to neighbourhoods and the high school), Princeton should develop interpretive signage to demonstrate pre- and post-fuel treatment forest stands/grassland conditions.	Increase public awareness and support of fuel management practices.	Princeton	5 years	Signs placed in one high-public use area, post-treatment	UBCM program funding available
45	High	When operational fuel treatments are conducted, treatment monitoring 5-10 years out should be completed by a qualified professional. This can be completed with a CWRP update or as a stand-alone exercise.	Assess the efficacy of the treatment and to schedule maintenance activities. It is cheaper to perform maintenance early when regeneration is small. Note: past fuel treatments on areas recommended in Princeton's 2006 CWPP were assessed as part of this CWRP development.	Princeton (Consultant)	Ongoing	All completed fuel treatments are reassessed 5-10 years, and ongoing, post-treatment	UBCM CRI funding available (~100/ha for assessment)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
46	High	Lobby RDOS for prescription development and implementation of FTUs that overlap past Princeton treatments at "Martin's Lake" and "Highway 3".	To reduce wildfire hazard in the Landscape Zone. Martin's Lake prescription development and treatments by the RDOS should be completed in conjunction with proposed FTU MART.	Princeton/RDOS (Consultant)	5 years	Prescriptions developed for high priority units within the Landscape Zone	UBCM CRI funding available (~$500 per hectare)
47	High	Princeton FD's Local FireSmart Representatives (LFRs) should assist neighbourhoods and homeowners in complying with FireSmart vegetation management principles at both the neighborhood and individual home-level.	Increase wildfire resiliency throughout priority neighbourhoods identified in this CWRP by collectively FireSmarting homes.	Local FireSmart Representative	5-10 years, and then ongoing.	FireSmart landscaping adopted in high priority FireSmart neighbourhoods (Table 17).	(time and cost dependent on level of effort)
48	High	Plan and implement a community/neighbourhood chipping program or bin disposal program with the help of neighbourhood champions, LFRs, and Neighbourhood FireSmart Committees, if possible. Consider offering chipping/bin services as an incentive for neighbourhoods to join the FireSmart Neighbourhood Recognition Program. Education of FireSmart yard and landscaping principles, including chipping specifications should be incorporated into the program.	Aid homeowners in removing hazardous debris from properties, while educating residents on FireSmart yard and landscaping principles.	Princeton (Local FireSmart Representative, Community Champion)	3 years, and then yearly	Chipping/Bin program active and conducted yearly for high priority FireSmart neighbourhoods (Table 17).	UBCM CRI funding available (Example cost is $7,400: chipping contractor costs (four 8-hour days @ ~$200 per hour); $1000 for outreach)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

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
CFS	Community Funding and Support
CI	Critical Infrastructure
CIIZ	Critical Infrastructure Ignition Zone
CRI	Community Resiliency Investment
CWPP	Community Wildfire Protection Plan
CWRP	Community Wildfire Resiliency Planning
DPA	Development Permit Area
EMBC	Emergency Management British Columbia
FBP	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 (also see Structure Ignition Zone)
HRVA	Hazard Risk and Vulnerability Analysis
LRMP	Land and Resource Management Plan
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
MOTI	Ministry of Transportation and Infrastructure
NDT	Natural Disturbance Type
PSTA	Provincial Strategic Threat Assessment
OCP	Official Community Plan
SWPI	Strategic Wildfire Prevention Initiative
UBCM	Union of British Columbia Municipalities
VAR	Values at Risk
WRR	Wildfire Risk Reduction
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

In October 2020, B.A. Blackwell and Associates Ltd. was retained to assist The Town of Princeton (Princeton) in developing a Community Wildfire Resiliency Plan, hereinafter referred to as the CWRP. This CWRP revisits areas assessed in Princeton's 2006 Community Wildfire Protection Plan (CWPP), but with a focus on integrating the updated Provincial Strategic Threat Analysis (PSTA), updated BC Wildfire Service (BCWS) fuel type mapping, and an improved wildfire threat analysis methodology, all with a focus on the seven FireSmart principles.

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. 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).[3] CWRPs are an invaluable opportunity to proactively manage wildfire risk and increase community resilience to wildfire.

1.1 PLAN PURPOSE AND GOALS

The purpose of this CWRP is to identify and update the wildfire risk specific to Princeton and the surrounding eligible WUI, to describe the potential consequences of wildfire to the community, and to examine options and strategies to reduce the wildfire risks. This CWRP provides a reassessment of the level of wildfire risk to Princeton and gives Princeton a current and accurate understanding of the threats to human life, property, and critical infrastructure faced from wildfire. The goal of this CWRP is for it to serve Princeton as 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 Princeton 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
5) options and strategies to reduce wildfire risk in seven FireSmart disciplines: education, legislation and planning, development considerations, interagency cooperation, cross-training, emergency planning, and vegetation management.

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

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 CWRP DEVELOPMENT SUMMARY

The planning for this CWRP was based on applying the Princeton Volunteer Fire Brigade's (Princeton FD) Fire Response Area (FPA) as the project's area of interest (AOI).[4] From this, the associated eligible WUI, herein after referred to as the WUI (which represents a one-kilometer buffer around a structure density of 6+ structures/km^2 within the AOI) was mapped, delineating the plan's focus area (see Map 1: Princeton CWRP AOI and WUI). The CWRP development process consisted of four general phases:

1) Consultation

Key players were assembled to form Princeton's Community FireSmart Resiliency Committee (CFRC). Discussions with the FireSmart Coordinator for the Regional District of Okanagan-Similkameen (RDOS) identified that the RDOS has an existing CFRC (established through its recent 2020 CWPP), of which Princeton is an active member. Thus, the CFRC for Princeton reflects the key planners and responders most involved in Princeton's local FireSmart, wildfire resiliency planning, and wildfire and emergency response. Members of Princeton's CFRC are: Manager of Protective Services, Princeton (Ed Atkinson); Fire Chief, Princeton (Rob Banks); Wildfire Prevention Officer, BCWS Kamloops Fire Centre (Michael Aldred); Prevention Specialist, BCWS Kamloops Fire Centre (Nicole Bonnett); and Wildfire Technician, BCWS Merritt Fire Zone (Jonas Joe). 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, during field visits to Princeton, and on an ongoing basis throughout plan development, and were integral in providing CWRP review and approval.

BCWS representatives from the Kamloops Fire Centre, Merritt Fire Zone, and the provincial Wildfire Threat Specialist were consulted also consulted throughout this document's development process.

Information sharing took place with 23 First Nations regarding locations or potential for possible cultural values at risk requiring protection consideration (see Appendix I: List of First Nations and Associated Governments Consulted). Information sharing consisted of an initial phone call and subsequent distribution of a referral letter and information package (maps, explanation of the CWRP and the CWRP draft). Due to the current COVID-19 pandemic, many First Nations' offices have been closed and are operating on an emergency basis, making review and comment of this document challenging.

[4] Agreed upon by representatives from Princeton, UBCM, and BCWS during CWRP planning meetings and discussions that took place between October 2020 and February 2021.

Additional stakeholders were consulted to identify synergies, opportunities for collaboration, and ensure linkages with adjacent and overlapping planning. These stakeholders included:

- Weyerhaeuser (Brian Drobe): local volume-based forest harvesting licensee/company, and operations and planning managers of the Vermilion Forks Community Forest.
- Rockridge Canyon (Carolyn Mortensen): all-season hotel, camp, and events property located approximately eight kilometers southeast of Princeton (the property contracts fire protection and response to the Princeton FD).
- Local woodlots: W0393, W0350, W1446, and W1861.

2) Review of Relevant Plans and Legislation

All municipal, regional, and provincial bylaws, policies, plans, and guidelines are reviewed, and sections within that are relevant to the CWRP are identified (SectionSECTION 2:).

3) Identification of Values at Risk and Wildfire Risk Assessment

The identified values at risk are described in Section 3.2 and concepts of wildfire threat and risk are elaborated on in SectionSECTION 4:The wildfire threat to Princeton was assessed through a combination of the following approaches:

- Natural fire regime and ecology,
- Provincial Strategic Threat Analysis, and
- 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)

SECTION 2: RELATIONSHIP TO OTHER PLANS AND LEGISLATION

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 sections within that are relevant to wildfire emergency planning and response.

2.1 LOCAL AUTHORITY EMERGENCY PLAN

Princeton's emergency preparedness and response is managed in-house and is guided by higher level emergency management legislation such as the provincial Emergency Program Act.[5] The Emergency Program Act describes the various roles and administrative duties of the province and local governments with regards to emergency organization, the implementation of higher-level emergency plans, the processes of declaring a state of emergency, and coordinating post disaster relief programs and assistance. Princeton's evacuation planning and management documents were updated in June 2020 and are discussed in section 3.2.1.

2.2 LINKAGES TO OTHER CWPPS/CWRPS

Town of Princeton 2006 CWPP

Princeton's 2006 CWPP was reviewed, and the recommendations were analyzed. Recommendations that were addressed or completed include:

- Completing fuel treatments on five proposed fuel treatment units: August Lake Road and Copper Mountain Road, Highway 3 West, Martin's Lake, West China Creek Road, and Airport Road.

Regional District of Okanagan-Similkameen (RDOS) 2020 CWPP

Frontline Operations Group recently completed a CWPP update to 2020 for the RDOS. Proposed recommendations and action items that pertain to this CWRP include:

- Establish a Wildfire Development Permit Area for the entire RDOS. As various OCPs are amended or updated, ensure that requirements and guidelines complement the Wildfire Development Permit Area requirements.
    - *This CWRP recommends Princeton create a Wildfire Development Permit Area (Section 5.3).*
- Apply for funding to prescribe and treat recommended areas on regional district lands, municipal owned lands, Crown lands, and within BC Parks.
    - *Four recommended areas (all on crown land) for prescription and treatment overlap with this CWRP's WUI: EA_H_001, EA_H_002, EA_H_003, and EA_H_023.*
- Develop a Regional District wildfire risk reduction communications plan, which includes creating the South Okanagan Similkameen Wildfire Prevention Working Group.

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

- *Princeton is a member of the South Okanagan Similkameen Wildfire Prevention Working Group (now known as a Community Wildfire Resiliency Committee).*

- Support fire use and prescribed fire in the region.
  - *Prescribed fire is recommended as a treatment type for treatment units proposed by this CWRP (Section 5.7).*

2.3 TOWN OF PRINCETON OFFICIAL COMMUNITY PLAN 2008

An Official Community Plan (OCP) is an aspirational expression of the objectives and policies of the local government and provides Princeton with a long-range framework to guide, monitor, and evaluate future land use and development. Table 2 below summarizes the objectives and policies within Princeton's OCP that are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster. The current OCP includes amending bylaws up to Bylaw No. 977, 2020.

Table 2: Summary of Princeton's Official Community Plan emergency and wildfire-related objectives and policies and their relationship to this CWRP

Section, Sub-section, Goal	Description and Relationship to CWRP
5.1.2 Land Use Policies – General	Ensure the sound management and stewardship of any new development by requiring connections to the Town's water and sanitary sewer systems. • *Water infrastructure and availability is integral to fire fighting and stopping a wildfire in the WUI from either entering the wildland from homes and properties, or vice versa.*
5.2.2 Land Use Policies – General Residential	Plan future residential land uses with respect to the community's existing infrastructure (roads, water and sewer). • *Water infrastructure and availability is integral to fire fighting and stopping a wildfire in the WUI from either entering the wildland from homes and properties, or vice versa.* • *Two points (roads) of access/egress are vital to safe emergency evacuations as well as access to emergencies by responders (including during wildfires).*
5.2.8 (.1 and .2) Land Use Policies – General Residential	New development will not be considered in the Snow Patch or Allison Heights areas of the Town until: .1 plans are prepared that addresses the servicing requirements created by new development, specifically: a) an extension of water, sewer, drainage and road services; and b) upgrades to water supply and sewage treatment facilities. • *Water infrastructure and availability is integral to fire fighting and stopping a wildfire in the WUI from either entering the wildland from homes and properties, or vice versa.* .2 A local Parkland Plan has been prepared measures have been taken to ensure that appropriate parkland will be provided as part of the new development. • *If parkland is acquired by the municipality, Princeton will be liable for wildfire hazards and risks associated with it.*
5.3 (.2 and .3) Land Use Policies – Country Residential	Consider country residential designations for areas outside of community sewer and water, or only with a community water system. Maximum density is one dwelling per 1 ha if on a community water system or 2 ha if not on a community water system.

Section, Sub-section, Goal	Description and Relationship to CWRP
	• *Water infrastructure and availability is integral to private property structure protection during a wildfire in WUI intermix[6] areas.*
5.4.3 Land Use Policies Low Density Residential 5.5.6 (.1) Land Use Policies Medium Density Residential 5.6.5 (.1) Land Use Policies – Mobile Home Parks	All Low-Density Residential areas must be serviced with a community water system and community sewer. Consider new Medium Density Residential designations in areas that meet the following criteria: on community water and sewer systems. Consider new Mobile Home Park designations in areas that meet the following criteria: on community water and sewer systems. • *Water infrastructure and availability is integral to fire fighting and stopping a wildfire in the WUI from either entering the wildland from homes and properties, or vice versa.*
5.8.3 Land Use Policies – Highway Commercial	Ensure efficient and safe traffic flows at access points along the Highways 3a and 5. • *Identified as primary evacuation routes in Princeton's 2020 Emergency Evacuation Plan, safe traffic flow at highway access points is vital to emergency evacuations as well as access to emergencies by responders (including during wildfires).*
5.10.5 Land Use Policies – Industrial	Encourage new industrial uses to incorporate appropriate buffering and screening through landscaping such as tree retention, supplementary planting, earthworks/berms and fencing in order to minimize impacts on neighbouring properties. • *Addressed in section 5.3 of this CWRP, this would be most effective if wildfire landscape guidelines were in place.*
5.10.11 Land Use Policies – Industrial	Ensure resource extraction operations, including forestry and mining, are responsible for restoring the landscape upon completion of the operations. • *Addressed in section 5.3 of this CWRP, restoration of the landscape within and adjacent to the WUI should be done with a focus on wildfire prevention and reduction.*
5.13.1 Land Use Policies – Parks and Recreation	Designate school playgrounds and playing fields, neighbourhood parks, community sports and activity fields, natural areas and park corridors as Parks, as shown on the Land Use Map (Schedule A). • *Princeton is liable for wildfire hazards and risks associated with municipal "Parks".*
5.15.6 Land Use Policies – Airport	Consider the extension of water and sewer services to the airport. • *Water infrastructure and availability is integral to fire fighting and stopping a wildfire in the WUI from either entering the wildland from homes and properties, or vice versa.*
6.2 (.4, .5., .6) Infrastructure Policies – Water	Provide an adequate supply and pressure of water for fire protection services throughout the community. Facilitate fire flow levels to the area west of Asp Creek and to the Snow Patch area. Explore possible supplementary water sources. • *Water infrastructure and availability is integral to fire fighting and stopping a wildfire in the WUI from either entering the wildland from homes and properties, or vice versa.*

[6] Intermix: Isolated developments embedded within the forest. Interface: Where the forest meets the community.

Section, Sub-section, Goal	Description and Relationship to CWRP
7.1 (.1 - 5, .6) Visual Quality and Aesthetics Policies - General	Policies regarding enhancing and maintaining the visual quality and aesthetics of neighbourhoods, public spaces, and tailing sites by creating parks, picnic areas, etc., and/or utilizing methods that include landscaping. • *Princeton is liable for wildfire hazards and risks associated with municipal "Parks" and other public municipal spaces.* • *Addressed in section 5.3 of this CWRP, this would be most effective if wildfire landscape guidelines were in place.*
8.1 (.1 - .5) Healthy and Active Living Policies – Parks	Implement the River Park Plan that will establish destination points for a number of community trails and pathways, providing public access and recreation opportunities that utilize Princeton's riverfront amenities. Ensure local parks are established in association with new development in residential areas. Dedicate five percent (5%) of the land being subdivided in a residential area, or cash in lieu of the land, to the Town of Princeton for parkland purposes in accordance with the Local Government Act. Consider establishing a park in the Allison Heights area. Establish a Parks and Recreation Master Plan that provides direction for future planning for parks within Princeton. • *Princeton is liable for wildfire hazards and risks associated with municipal "Parks".*
10.1.7.1 d) Economic Policies – Community Forest Initiative	Work with the Ministry of Forests and Range to develop a Community Forest Agreement for Princeton and the surrounding area that will: facilitate opportunities for innovative forest activities within the forest tenure area. • *Recognition and planning for interface and intermix WUI areas within and adjacent to the community forest should be considered.*
11.1.1 Policies to Engage and Protect the Community – General	Empower and involve residents in establishing and working toward collective community goals through engagement and shared leadership. • *Addressed in section 5.1 of this CWRP, FireSmart Canada's Neighbourhood Recognition Program applies.*
11.1.9 (.1 – 5) Policies to Engage and Protect the Community – General: Fire Hazards	Require applicants of subdivision and development proposals to demonstrate that appropriate Fire Smart principles (i.e., fireproofing) have been taken into account. Review existing studies and consider wildfire mitigation in areas where there is a perceived threat. Coordinate with provincial ministries to improve the awareness of emergency forest fire response programs. Encourage new development adjacent to forested areas to take fire prevention measures upon the advice of the Town's Fire Department and appropriate government ministries. Support cooperative work between the Ministry of Forests and Range and the Approving Officer in evaluating subdivision applications in order to minimize the potential for fire damage in natural areas surrounding Princeton. • *Addressed in this CWRP as part as part of the seven FireSmart principles: Development and Planning (section 5.3), and Interagency Cooperation (section 5.4).*
12.2.9 Cultural and Heritage Policies – Heritage	Work with the Upper Similkameen Indian Band and the Regional District of Okanagan-Similkameen to develop a cultural heritage resources protection protocol as outlined in the Memorandum of Understanding (January 17, 2007). • *Important for helping to guide activities related to wildfire risk reduction.*

2.4 LOCAL BYLAWS

Table 3 below contains local policies which are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster.

Table 3: Summary of local wildfire and emergency related bylaws

Town of Princeton Bylaw	Description and Relationship to CWRP
393, 1982 Prohibit the Fouling or Contamination of the Atmosphere Bylaw	A bylaw to prevent, abate and prohibit the fouling or contamination of the atmosphere within the Municipality of Princeton. Relevant clauses include: • *No one may light or ignite an outdoor fire of any kind between April 15th to October 15th.* • *Exceptions to this prohibition include - for permanent outdoor fireplaces and barbecues approved by Assistant Fire Commissioner; using portable stoves, barbecues, or cookers; and burning material for land clearing, with a permit.*
523, 1988 Property Maintenance (Unsightly Premises) Bylaw	A bylaw to establish required standards for the maintenance of property and to prohibit littering. Relevant clauses include: • *Impermissible to allow rubbish to accumulate around premises.* • *Discarded materials and rubbish include wood, leaves, cardboard, paper.* • *Owners and occupiers of property must clear the property of brush, trees, noxious weeds, wild grass.*
743, 2002 Princeton and District Landfill Bylaw	A bylaw to establish regulations and charges for waste disposal at the Princeton & District Landfill. Relevant clauses include: • *Prunings, processed prunings, wood-waste, processed wood-waste, and yard and garden waste are accepted.* • *Processed prunings & wood-waste means material has been chipped to less than 2 inches / 50 mm in any dimension.* • *Yard and garden waste, wood waste (also noxious weeds and infested vegetation) are free for disposal throughout the year.*
904, 2015 Smoke Free Outdoor Places Bylaw	A bylaw to protect the health and safety of citizens and visitors by prohibiting smoking in specific outdoor places. Relevant clauses include: • *No smoking in any public place (some examples include parks, playing fields, and named municipal parks) or during an outdoor special event.*
913, 2016 Fireworks Regulation Bylaw	A bylaw stating Council can regulate, prohibit, and impose requirements in relation to the sale or disposal to any person of firecrackers and fireworks. Relevant clauses include: • *Person/ organization can apply to Council for a permit for consumer or display fireworks.* • *Council can impose requirements or conditions on applicants to ensure protection of people and property.* • *No person can hold, possess, store, explode, set off, sell or purchase firecrackers.* • *The sale of fireworks requires a special business license. Consumer fireworks may be sold to persons or organizations (with permit) between October 18th-31st and December 18th-31st. Display fireworks may not be sold to any person or organization.*

Town of Princeton Bylaw	Description and Relationship to CWRP
997, 2021 Town of Princeton Volunteer Fire Department Bylaw	A bylaw for the continuation and regulation of the Princeton Volunteer Fire Department. The bylaw is robust, and addresses: • *Service areas and operation outside of them.* • *The Fire Chief's ability to: organize and plan for things relating to: fire response, planning, prevention, inspections, equipment; investigate fire causes; provide recommendations on fire-related issues on the development of properties; post restrictions/prohibitions to burning and public access to outdoor spaces; negotiate mutual aid agreements; remove any substance or thing that poses a fire or safety risk from property.* • *Regulations for backyard, campfire, and outdoor fires.* • *Fuel and hazard risk reduction activities on private properties.* • *Wildfire and wildland-urban interface fires as part of the scope of service the Department provides.* • *Wildfire training to members, including NFPA 1051 Level I.*
808, 2008 Official Community Plan Bylaw	A bylaw to establish the 2008 Official Community Plan.
RDOS Bylaw	**Description and Relationship to CWRP**
2497, 2012 Official Community Plan Bylaw	Establishes the Official Community Plan for Electoral Area "H" Rural Princeton. Relevant clauses include: • *Subdivision application referred to the RDOS by the Regional Subdivision Approving Authority for development in areas identified in the CWPP & shown on Schedule E may require a fire hazard risk assessment from the applicant.* • *Rezoning application submitted to the RDOS in areas identified in the CWPP and shown on Schedule "E" may require a fire hazard risk assessment from the applicant and provide a recommended fire hazard mitigation strategy.* • *Encourages the Regional Subdivision Approving Authority to require that where a fire hazard mitigation strategy has been prepared the developer enter into a restrictive covenant to ensure the strategy is followed.* • *Encourages use and practice of wildfire mitigation programs (i.e. FireSmart).*
2898, 2020 Open Burning Bylaw	A bylaw to regulate open burning within the Regional District of Okanagan-Similkameen Fire Protection Areas.[7] Relevant clauses state: • *Fire Chief can impose campfire bans within Fire Protection Areas.* • *Permitted burning material piles and stubble grass burns only between October 15 through to April 15. Fire Chief may extend this burning season. Open burning outside of requirements may only be granted with permit granted by Fire Chief.* • *Regulations for campfires.* • *Regulations for burning of Permitted Burning Materials, or stubble grass.*
2375, 2006 Emergency Planning Program	A bylaw to establish an Emergency Planning Program Service for member municipalities and Electoral Areas, including EA H, Rural Princeton. • *Includes Electoral District H, Rural Princeton.* • *Describes cost recovery for program and service boundaries.*

[7] Fire protection areas the RDOS is responsible for do not overlap with this project's WUI.

Town of Princeton Bylaw	Description and Relationship to CWRP
2875, 2019 Fire Department Operational Bylaw	A bylaw guiding the administration and operation of fire departments within RDOS. • *This bylaw gives authorization for the provision of fire protection services to Anarchist Mountain FD, Kaleden VFD, Keremeos and District FD, Naramata FD, Okanagan Falls FD, Tulameen & District FD, and Willowbrook FD.* • *A number of these fire departments have mutual aid agreements with the Princeton Fire Department.*
2819, 2008 Solid Waste Collection and Drop Off Service Bylaw	A bylaw to regulate solid waste collection service within the RDOS. • *Unlimited yard waste collection from residences as long as it is packaged properly and no unpermitted waste is included (noxious weeds, commercial agricultural waste etc.).*
2637, 2013 Unsightly Premises Bylaw	A bylaw to regulate and control untidy and unsightly premises. • *Regulates overgrowth of trees and brush if they are a safety hazard, as well as accumulations of waste on private property.*
2854, 2019 Fireworks Bylaw	A bylaw that prohibits the sale or disposal of fireworks within Electoral Areas D, F, and I. • *Does not apply to EA H, Rural Princeton.*

2.5 OTHER LOCAL PLANS

Table 4 below contains other local plans and policies which are directly relevant to the CWRP.

Table 4: Summary of other Local Plans and Policies relating to the CWRP

Plan type	Description and Relationship to CWRP
Town of Princeton Parks and Recreation Strategy (2013)	The plan provides long range planning, vision, and guidance to the Town in managing and developing parks and recreation facilities, programs, infrastructure, and resources, while guiding appropriate investment. It represents a defined parks and recreation vision for the community. • *Parks, open spaces, and trails each have their own unique definition within the plan. Stewardship for them is the responsibility of Princeton. It was identified that there was no formalized park maintenance plan in place to guide watering, pruning, weeding, tree maintenance, and invasive species control.* • *Lists guidelines for park acquisition under Appendix E: Park Acquisition Guidelines.*
Town of Princeton Climate Action Plan (2011)	The plan is a collaborative effort between the Regional District of Okanagan Similkameen and the member municipalities of Keremeos, Oliver, Osoyoos, Penticton, Princeton, and Summerland to develop corporate and community climate action plans to meet their voluntary commitments under the Climate Action Charter and legislated obligations under the Local Government (Green Communities) Statutes Amendment Act (Bill 27, 2008). This report represents the Town of Princeton's Climate Action Plan. • *Princeton is committed to carbon neutrality and achieving this through carbon offset purchases. Activities relating to wildfire*

Plan type	Description and Relationship to CWRP
	risk reduction within the community (i.e., fuel treatments) create greenhouse gas emissions (GHG) and will need to be accounted for in Princeton's baseline GHG emission calculation.

2.6 LINKAGES TO HIGHER LEVEL PLANS AND LEGISLATION

Land use objectives, ministerial orders, and non-legal planning objectives outlined in Table 5 below should be reviewed, considered, and addressed during the fuel management prescription phase. Fuel management on Crown land within the WUI should aim to enhance these values, whenever possible, and the land manager must be consulted during prescription development regarding any overlapping values at risk, spatially explicit ministerial orders, or other notable values on the land base.

Table 5: Higher Level Plans and Relevant Legislation

Plan/Legislation	Description and Relationship to CWRP
Land Use Plans	No existing Land Use Plans cover Princeton and the WUI.
FRPA – Government Action Regulations (GARs)	Old Growth Management Area (non-legal). • *16 non-legal OGMAs overlap the WUI, and with three proposed fuel treatment units (CHINA, MART, and ROCK)* Wildlife Habitat Area • *Four WHA no-harvest zone polygons overlap the WUI, and none with proposed fuel treatment units.* • *One proposed WHA polygon overlaps with the WUI. It does not overlap with any proposed fuel treatment units.* Ungulate Winter Range • *51 UWR conditional-harvest zone polygons overlap with the WUI, and with three proposed fuel treatment units (ROCK, SUMM, AND CHINA).* Visual Quality Objectives • *VQO polygons overlap with over 70% of the WUI, and with nine proposed fuel treatment units: MART, AIR-1, AIR-2, SCHOOL, WEST-1, WEST-2, CHINA, WR-1, and WR-2.*
Woodlot Management Plans	Woodlot Management Plans apply to the three woodlots in the AOI. The primary purpose of a Woodlot Management Plans is to propose an allowable annual cut (AAC) for the woodlot license taking into account inventory information and resource management considerations. • *Four woodlots overlap with the WUI: W1861, W1446, W0393, and W0350.* • *One proposed fuel treatment unit is wholly or partially within a woodlot: SUMM (W1861).*
Forest Stewardship Plans (FSP)	FSP's illustrate Forest Development Units within which forest licensee's activities are planned for and describe strategies to address government objectives that are reflected in higher level plans. • *The Vermilion Forks Community Forest (CFA K2Y) partially overlaps with the WUI, and is managed by Weyerhaeuser Company Ltd, in partnership with Stu'wix Resources Ltd., and is a signatory on to their FSP.*

Plan/Legislation	Description and Relationship to CWRP
Community Forest (CF) Timber Management Operating Plan (2019)	• *One proposed fuel treatment unit is wholly or partially within the community forest: CHINA.* In accordance with Clause 5 of the Timber Management Agreement between Weyerhaeuser and the Vermilion Forks CF, an Annual Operating Plan is submitted to be approved by the CF board.
BC Provincial Open Burning Smoke Control Regulation (OBSCR)	The OBSCR 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. • *Almost the entire WUI is within a High Smoke Sensitivity Zone (with the remainder in Medium).* • *One proposed treatment unit (SUMM) is within a Medium Smoke Sensitivity Zone. All other proposed treatment units are within the High Smoke Sensitivity Zone.*

SECTION 3: COMMUNITY DESCRIPTION

Located in Southern BC just east of the Cascade Mountains at the cross-roads of Highways 3 and 5A and at the confluence of the Tulameen and Similkameen rivers, Princeton is known as the "gateway to the Okanagan-Similkameen Valley". The town serves as a regional centre for the smaller towns/villages within RDOS Electoral Area H. Princeton, with a population of 2,828,[8] is characterized by its town centre, located on several blocks of along Bridge Street and Vermillion Avenue, isolated rural properties, small residential neighbourhoods, parkland, ranching, and various forest tenures (woodlots, a community forest, and volume-based licenses).

Princeton and the Similkameen Valley area (stretching south into Washington State) have been inhabited by the Smelqmix (Similkameen) Aboriginal Peoples since time immemorial.[9] 22 First Nation governments' (Indian Bands, First Nations, Tribal Councils, and Tribal Associations) traditional territories include Princeton. The Upper Similkameen Indian Band has one land parcel within the municipal boundary of Princeton.

Emergency management, fire protection, and solid waste services are provided to Princeton and the surrounding Electoral Area (EA) H residents by Princeton (via a cost sharing agreement with the RDOS for EA H residents). Land use planning, emergency management, building and development permits, bylaw enforcement, and administration are provided to Princeton residents by the municipality. Water and sewer are provided to most residents within Princeton's municipal boundary.

Princeton is comprised of low-lying valleys with stepped terraces of mixed grassland and sparse ponderosa pine/Douglas fir forest stands, and upper-slope denser-forested hills. The town lies in the rain shadow of the Cascades Mountains, making it one of the sunniest places in BC.

The economy of Princeton was historically driven by trapping, mining, and logging. European settlement began in the mid-1800s, and in the early 1900s the Kettle Valley Railway (later Canadian Pacific) was constructed, connecting Princeton to the Great Northern railway system.[10] Population spikes accompanied historic gold and mineral rushes, but since incorporation in 1978 Princeton's population has stayed relatively consistent. Forestry and mining remain important parts of the economy today (with its largest employers being the Copper Mountain Mine and Weyerhaeuser's lumber mill), along with other industries such as retail, tourism, and ranching.[11] Relevant socio-economic statistics are shown below in Table 6.

[8] "Census profile: Princeton (2016)". *statcan.gc.ca*. Statistics Canada. Retrieved 10 February 2017.
[9] https://www.lsib.net/?page_id=35
[10] "The rich history of Princeton or how Vermilion Forks made it on the map...", Princeton 2008 Visitors Guide, p.4
[11] "Everything you've ever wanted to know about Princeton...", Princeton 2008 Visitors Guide, p. 6.

Table 6: Princeton Socio-Economic Statistics[12]

Metric	Value	Data Source
Total Population	2,828	Census Canada, 2016
Population Density (people/km^2)	47.4	Census Canada, 2016
Median Age (years)	51.7	Census Canada, 2016
Housing Units	1145 Single Detached 60 Semi Detached 15 Duplex 20 Row 135 Apartment	Census Canada, 2016
Median Home Value	$248,448	Census Canada, 2016
Median Household Income	$51,913	Census Canada, 2016
Unemployment Rate	6.8%	Census Canada, 2016
Employment Rate	49.5%	Census Canada, 2016

Princeton is within the BC Wildfire Service (BCWS) Merritt Fire Zone which is part of the greater Kamloops Regional Fire Centre. The Princeton Volunteer Fire Brigade (Princeton FD) is responsible for fire protection within its Fire Protection Area (FPA), an area much greater than the municipal boundary and extends north, east, and south from town along the major highways (established under agreement/contract with the RDOS and whereby Princeton FD receives one-third of its yearly capital funding from the RDOS). Mutual aid agreements exist between Princeton FD, RDOS, five neighbouring municipalities, and BCWS. Generally, a fire that occurs outside of Princeton FD's FPA is under the jurisdiction of BCWS. However, under exceptional circumstances, such as high to extreme fire hazard conditions, Princeton FD can respond to an interface fire outside of their designated FPA when directed by the BCWS. Likewise, the BCWS can provide Princeton FD with resources and personnel within the FPA as requested. BCWS also operates a seasonal fire base with a unit crew in Princeton.

Two main concerns relating to Princeton's wildfire preparedness were expressed by the CFRC:

1) Single route access and egress neighbourhoods, and
2) The lack of FireSmart home construction and FireSmart vegetation management.

3.1 AREA OF INTEREST AND WILDLAND-URBAN INTERFACE

The AOI for the CWRP is Princeton FD's Fire Protection Area which encompasses a total of 8,866 hectares. The associated eligible WUI (referred to as 'WUI' throughout this document), which represents a one-kilometer buffer around a structure density of 6+ structures/km^2 within the AOI and defines the focus of this CWRP, encompasses a total of 16,475 hectares. A breakdown of area by ownership type is listed in Table 7. The AOI, WUI, and land ownership types are shown on Map 1.

Most of the land in the WUI is split between Crown Provincial (40% of the WUI) and Private (54% of the WUI). Princeton's municipal boundary encompasses 1,041 hectares of which 554 hectares are municipal

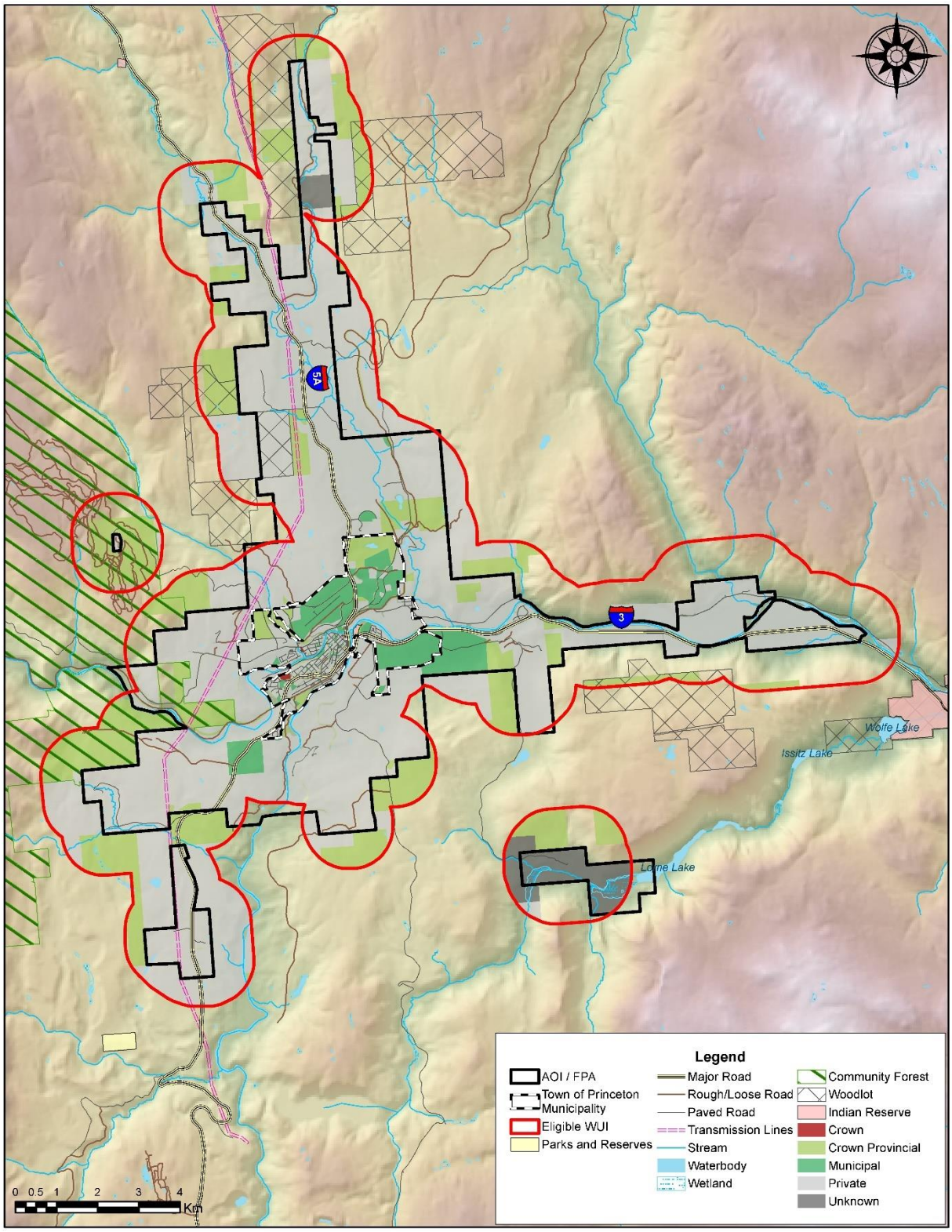
[12] Accessed via https://townfolio.co/bc/princeton

owned – representing 3% of the WUI. There are no Provincial Parks, National Parks, nor Ecological Reserves within the WUI.

Table 7: Land Ownership within the WUI

Land Ownership[13]	Area (ha)
Crown Agency	5
Crown Provincial	6,542
Federal	3
Municipal	554
Private	8,976
Unknown	395
Total	**16,475**

[13] The land ownership source is ParcelMap BC, provided by the Land Title and Survey Authority (LTSA). This dataset does not differentiate Indian Reserves from Federal Crown parcels.



Map 1: Princeton CWRP AOI and WUI

3.2 VALUES AT RISK

Protection of critical infrastructure (CI) 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 and/or restored quickly in the case of an emergency. CI includes emergency and medical services, electrical and natural gas services, transportation, water, social services, evacuation reception centres, and communications infrastructure. CI is shown on Map 2, and Table 8 details the inventory of CI identified in the WUI. Cultural, environmental, and other resource values are also addressed, and are displayed on Map 3.

3.2.1 EMERGENCY RESPONSE, PUBLIC SERVICES, AND COMMUNICATIONS

Princeton's evacuation planning and management documents were updated in June 2020 and contain four toolkits to be implemented in sequential order. The town is mapped into evacuation zones, with evacuation routes assigned to each neighbourhood. In the event of an evacuation order, Princeton is responsible for offering support services, including reception centres (Princeton can provide three emergency housing shelters and one emergency response centre, as listed in Table 8). Stated in the evacuation plan, "The primary evacuation routes include Highway 3 and Highway 5A, while secondary routes include Old Hedley Road, Princeton Summerland Road (seasonal), and Coalmont Road. The primary evacuation routes allow for multiple escape routes north, east, and west, which provides resilience for an all-hazard scenario."[14] Key evacuation routes within the WUI were assessed as part of this CWRP.

The Princeton General Hospital, located in the middle of town, is a Level 1 Community Hospital (acute care, laboratory, and 24-hour emergency)[15] and is part of the Okanagan health service area.

Telus Communications Inc. operates and maintains two cellular communication transceivers within the WUI. No communications towers are within the WUI, however both Telus and Rogers operate one each just outside it (Telus tower: approximately 3 km east of the Princeton Airport; Rogers tower: 1.4 km east of Rainbow Lake).[16] Princeton should request that Telus and Rogers conduct FireSmart assessments on all communication infrastructure and implement mitigation work as required.

3.2.2 ELECTRICAL POWER

A large fire has the potential to impact electrical service by causing disruption in network distribution through direct or indirect processes. For example, heat from flames or fallen trees associated with a fire event may cause power outages. The main source of electrical power in Princeton is provided by Fortis BC. Electrical service for most of the WUI is received through a network of wooden pole distribution lines sourced from the Princeton Substation. This system is well-mapped, and in the event of a wildfire Fortis BC will work with local and provincial emergency responders and employ their own emergency response

[14] Town of Princeton Public Evacuation Plan V4.0
[15] https://www.interiorhealth.ca
[16] Canadian Cellular Towers Map. https://www.ertyu.org/steven_nikkel/cancellsites.html?lat=49.467326&lng=-120.507354&zoom=13&type=Roadmap&layers=a&pid=0

protocols.[17] Neighbourhoods with small, street-side wooden poles that connect to homes are particularly vulnerable to fire. Utility right-of-way best management practices such as regular brushing and clearing of woody debris and shrubs are employed to help reduce fire risk, utility pole damage, and subsequent outages.

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. The CFRC identified that no secondary power sources are in place for any of the critical infrastructure within the WUI.

3.2.3 WATER AND SEWAGE

Within its municipal boundary, water (drinking and hydrant) and sewage services are provided by Princeton through a network of pump and lift stations and reservoirs. Water is sourced and treated at three well locations (drawing ground water associated with the Similkameen River – Memorial Park Wells #1 and #2, and Well Site #4.[18] The water and sewage networks cover almost the entirety of the commercial and residential areas within Princeton's municipal boundary. Sewage is pumped to, and treated in, reservoir ponds located on the south side of the Similkameen River, east of the town center (but still within the municipal boundary). The revenue for the operation, maintenance, capital, and administration of these utilities comes directly from landowners and is raised through taxation and other user fees. Outside of the municipal boundary, but within the WUI, the rural farming, ranching, and large-lot properties are responsible for their own water and sewage provisions. Water is sourced from registered points-of-diversion (streams) and private wells.

3.2.4 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders and include large propane facilities, landfills, rail yards, storage facilities containing explosives, pipelines, etc. Anywhere combustible materials, explosive chemicals, or gas/oil is stored can be considered a hazardous value. Protecting hazardous values from fires is important to preventing interface fire disasters.

Fortis BC has underground natural gas pipelines that run throughout Princeton supplying natural gas to almost all neighbourhoods. The main supply lines are along Old Hedley Road and Highway 5A.[19] 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.[20]

Refuse for Princeton and the surrounding RDOS Electoral Area H is collected at the Princeton Garbage Dump. Hazardous/combustible materials including, but not limited to, refrigerators, mattresses,

[17] https://www.fortisbc.com/safety-outages/preparing-for-emergencies/wildfires-and-evacuations
[18] Town of Princeton 2019 Water Quality Report
[19] Servicerequestportal.fortisbc.com/newgasline
[20] https://www.fortisbc.com/safety-outages/preparing-for-emergencies/wildfires-and-evacuations

construction debris, tires, vehicle batteries, propane tanks, oil and oil filters, and plastics are accepted (both free and for a fee).

Princeton houses several forestry-related industrial facilities, all of which can be considered hazardous values due to the large amount of fuel that can be ignited in a wildfire event. Weyerhaeuser operates a large lumber mill with associated log storage, lumber storage, and wood waste dumping/storage (bark mulch, chips) facilities. Adjacent to Weyerhaeuser's operations Princeton Standard Pellet Corp. operates a pellet production plan. Across town on the south side of the Similkameen River, SBC Firemaster Ltd. has a firewood production and log storage facility.

The management and treatment of fuels in proximity to hazardous infrastructure is critical to reduce the risks associated with both structural fire and wildfire. Specifically, best management practices recommended for management of hazardous values include:

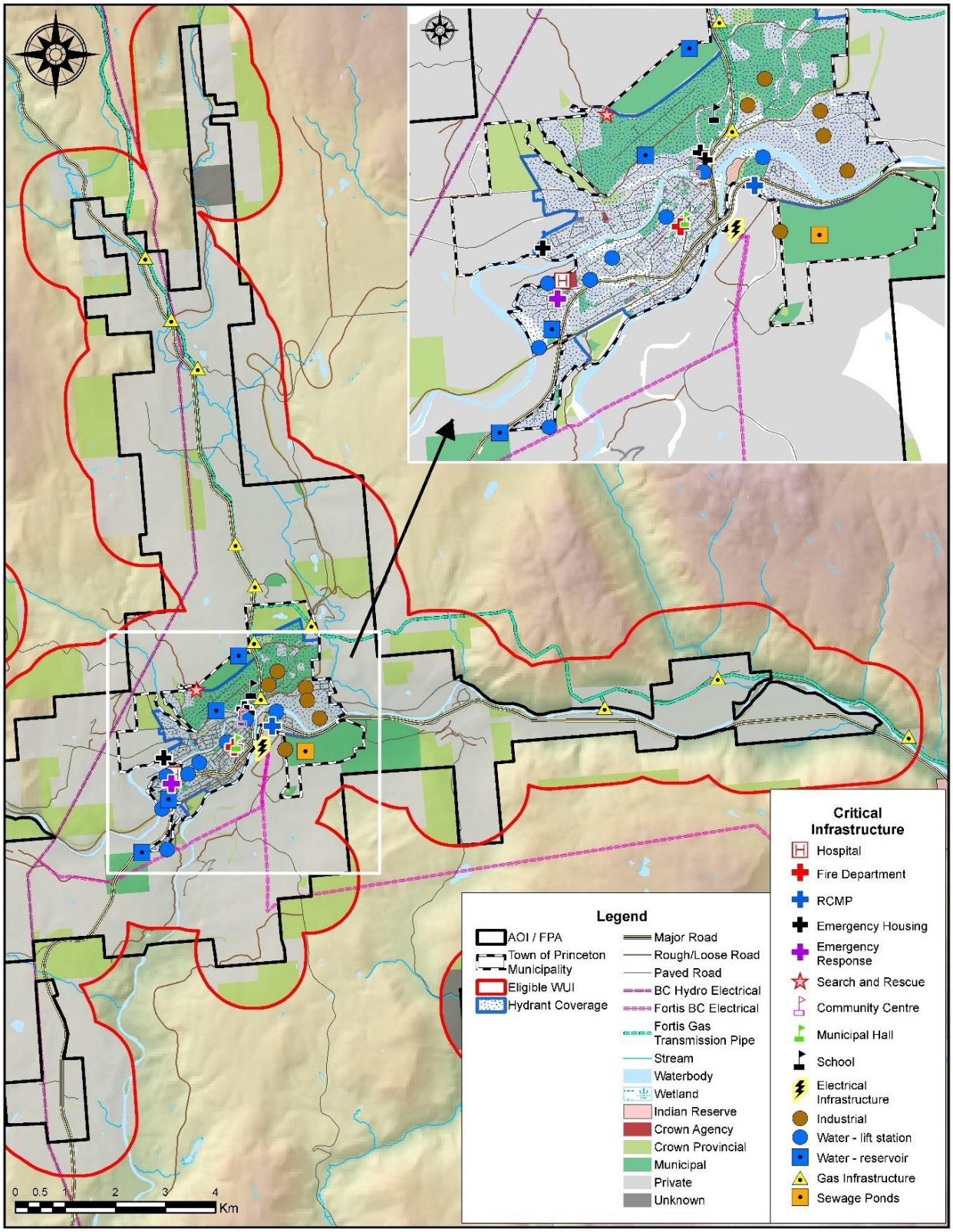
1) incorporating FireSmart planning and setback requirements for all infrastructure in this category,
2) maintaining emergency fuel/propane emergency shut off procedures to be enacted immediately and efficiently in the event of an approaching wildfire or ember shower, and
3) Installing sprinkler systems to keep wood accumulations/stacks (branches, logs, lumber, firewood, etc.) damp, especially during the fire season. This is specifically applicable to wood fibre industrial sites.

Table 8: Critical Infrastructure within the WUI

Critical Infrastructure Type	Critical Infrastructure Name	Address/Intersection/Location
Emergency Response, Public Services, Electrical, Gas, and Communications		
Community Centre	Riverside Community Centre	148 Old Hedley Rd, Princeton, BC V0X 1W0
Emergency Housing	Princeton and District Arena	167 Old Hedley Rd, Princeton, BC V0X 1W0
	Princeton Baptist Church	160 Old Hedley Rd, Princeton, BC V0X 1W0
	John Allison Elementary School	499 Corina Ave, Princeton, BC V0X 1W0
Emergency Response Centre	Vermilion Forks Elementary School	102 Ridgewood Dr, Princeton, BC V0X 1W0
Fire Department	Princeton Volunteer FD	162 2nd St, Princeton, BC V0X 1W0
Hospital	Princeton General Hospital	98 Ridgewood Dr, Princeton, BC V0X 1W0
Municipal Hall	Town Hall of Princeton	151 Vermilion Ave, Princeton, BC V0X 1W0
RCMP	RCMP detachment	200 BC-3, Princeton, BC V0X 1W0
Resort	RockRidge Canyon Camp	2000 Willies Ranch Rd, Princeton, BC V0X 1W0
School	Princeton Secondary School	201 Old Merritt Rd, Princeton, BC V0X 1W0
Search and Rescue	Princeton Ground Search and Rescue Society	175A Airport Rd, Princeton, BC V0X 1W0
Electrical Infrastructure	BC Hydro Princeton Substation	49°27'27.48"N 120°30'7.23"W
	BC Hydro OH Transmission Line	Line ID: 1L251 (as mapped)
	Fortis BC OH Transmission Line	Line ID's: unknown
Communications Infrastructure	Telus Transceiver	283 Burton Ave, Princeton, BC V0X 1W0
	Telus Transceiver	Princeton Summerland Road just north of David Browne way intersection. 49° 28' 17.04"N 120° 29' 36.6"W
	Telus Tower	Approx. 3.5km west of Princeton Airport 49° 28' 14.52"N 120° 33' 55.08"W
	Rogers Tower	Approx. 1.4km east of Rainbow Lake 49° 28' 45.12"N 120° 27' 48.96"W
Water and Sewage		
Water – Source Well Sites and Treatment Locations	Memorial Park Well Sites #1 and #2	Beside Centennial Pool 49°27'50.81"N 120°29'50.89"W
	Well Site #4	
Water - lift station	Lift/Pump Station	South end of Westridge Drive 49°26'27.06"N 120°31'49.34"W
	Lift/Pump Station	South of the Ridgewood neighbourhood on the west side of the KVR tunnel 49°26'53.58"N 120°31'51.62"W
	Lift/Pump Station	Glenview Crescent 49°27'14.66"N 120°31'44.62"W
	Lift/Pump Station	Mayne Avenue near Princeton Place 49°27'14.73"N 120°31'23.13"W
	Lift/Pump Station	Mayne Avenue near Parsons Avenue 49°27'21.46"N 120°31'11.09"W
	Lift/Pump Station	Billiter Avenue near Warren Street 49°27'33.55"N 120°30'42.00"W
	Lift/Pump Station	Southeast side of Riverside Community Centre

		49°27'47.42"N 120°30'21.35"W
Water - reservoir	Reservoir	North side of the Princeton Airport, west of Airport Road and Old Merritt Hwy junction 49°28'28.39"N 120°30'23.92"W
	Reservoir and Lift Station	South end of The Ridgeway 49°26'59.48"N 120°31'44.32"W
	Reservoir and Tower	South side of the Princeton Airport on Jacobsen Road 49°27'54.31"N 120°30'50.20"W
	Westridge Reservoir and Tower	West of the Westridge neighbourhood along Highway 3 49°26'26.57"N 120°32'14.71"W
Hazardous Materials		
Industrial	SBC Firemaster Ltd (firewood production)	256 Copper Mountain Rd, Princeton, BC V0X 1W0
	Princeton Garbage Dump	171 Princeton Summerland Rd, Princeton, BC V0X 1W0
	Princeton Standard Pellet Corp.	301 Old Hedley Rd, Princeton, BC V0X 1N0
	Weyerhaeuser – Logs, Lumber Storage, Mill	201 Old Hedley Rd, Princeton, BC V0X 1W0
	Weyerhaeuser – Bark Mulch Dump Site	Southwest of the Princeton Dump between Highway 5A and Princeton-Summerland Road 49°28'8.18"N 120°29'56.45"W
	Princeton Sewage Ponds	Southeast of the intersection of Darcy Mtn Road and Copper Mountain Road 49°27'23.43"N 120°29'25.45"W
Gas Infrastructure	Fortis BC Silvius TP Service	East side of Highway 5A approx. 1km north of the intersection with Summers Creek Road 49°32'50.74"N 120°31'25.74"W
	Fortis BC Summers Creek Road TP Service	East side of Highway 5A at the intersection with Summers Creek Road 49°32'9.24"N 120°31'4.69"W
	Fortis BC Belfort Road TP Service	West end of Belfort Road 49°31'36.42"N 120°30'42.27"W
	Fortis BC Cooks TP Service	East side of Highway 5A approx. 1km north of the intersection with Sunflower Estates Road 49°29'41.27"N 120°30'18.58"W
	Fortis BC Byrne TP Service	East side of Princeton-Summerland Road between the rodeo grounds and Rainbow Lake 49°28'45.08"N 120°29'9.59"W
	Fortis BC Walker TP Service	East side of Highway 5A just north of the intersection with Laurie Currie Way 49°28'37.06"N 120°30'7.41"W
	Fortis BC Old Hedley Road TP Service	Old Hedley Road approx. 7.5km east of Princeton 49°27'36.79"N 120°24'26.07"W

	Fortis BC Sunflower Estates Gate Station	Southeast corner of the intersection of Highway 5A and Sunflower Estates Road 49°29'13.39"N 120°30'2.31"W
	Fortis BC Hayes Creek Gate Station	Old Hedley Road approx. 10.5km east of Princeton 49°27'50.19"N 120°22'31.96"W
	Fortis BC Princeton Gate Station	Northeast corner of the intersection of Highway 5A and Old Hedley Road 49°28'0.53"N 120°30'5.37"W
	Fortis BC Labrash Gate Station	Old Hedley Road approx. 14.25km east of Princeton 49°27'2.49"N 120°19'28.17"W
	Fortis BC Gas Transmission Pipes	Line Loops: KIN PRI 323, PRI LTL 88, PRI OLI 323



Map 2: Critical Infrastructure within the WUI

3.2.5 CULTURAL VALUES

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

The MFLNRORD Archaeology Branch confirms that there are known overlaps with archeological sites within the WUI, and there is high to moderate potential for previously unidentified archeological sites to exist elsewhere in the WUI. Prior to stand modification for fire hazard reduction, and depending on treatment location, preliminary reconnaissance surveys and/or archeological 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.

3.2.6 HIGH ENVIRONMENTAL VALUES

Table 9 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 3.

Table 9: Publicly available occurrences of Red and Blue-listed species recorded in the WUI

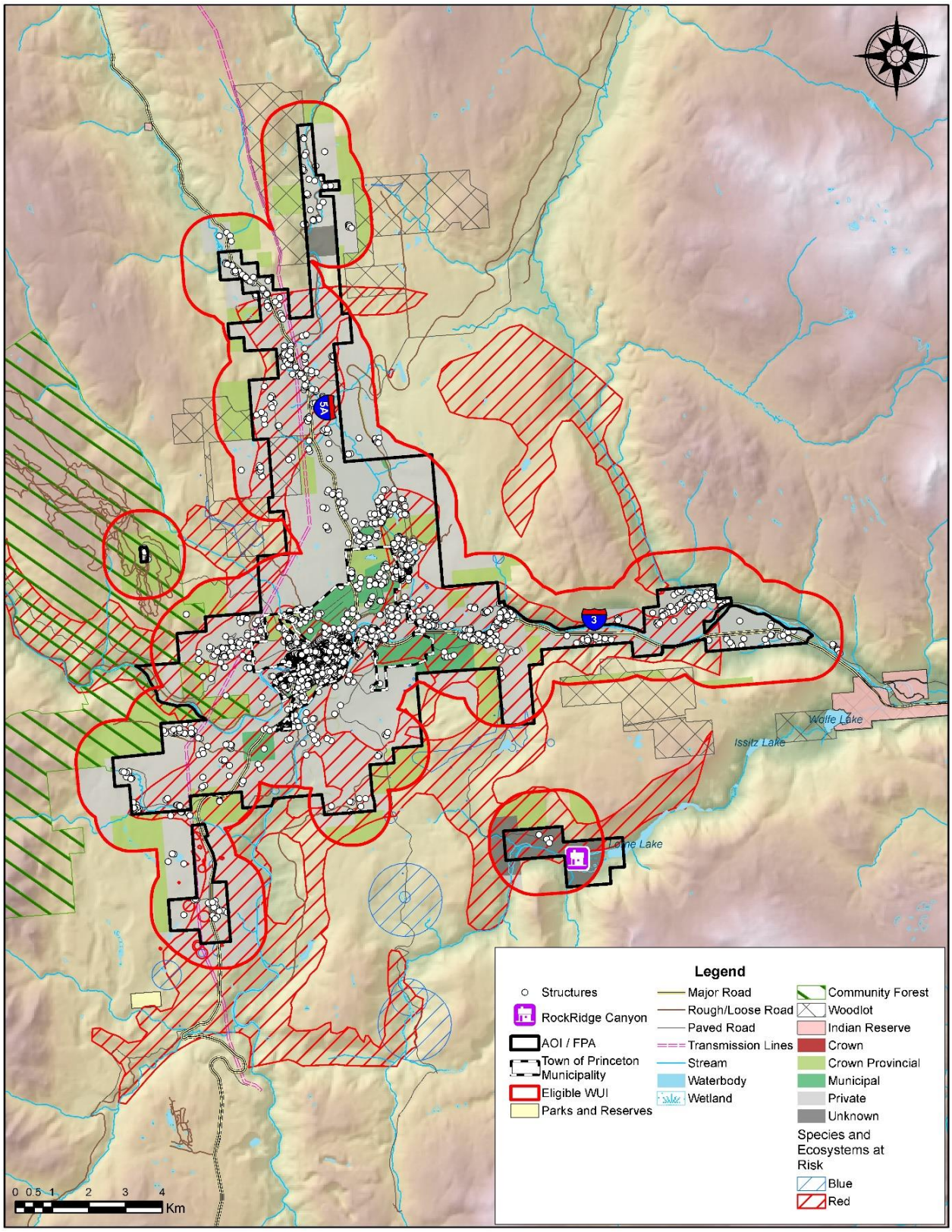
Scientific Name	Common Name	Category	BC List	Habitat Type	Area (Ha)
Entosthodon rubiginosus	Rusty Cord-moss	Nonvascular Plant	Blue	Palustrine: Herbaceous Wetland	0.2
Polygonum polygaloides ssp. confertiflorum	Close-flowered Knotweed	Vascular Plant	Blue	Perrestrial: Temporary Pool, Forest Needleleaf	11.1
Psilocarphus brevissimus var. brevissimus	Dwarf Woolly-heads	Vascular Plant	Red	Palustrine: Temporary Pool	4.3
Collomia tenella	Slender Collomia	Vascular Plant	Red	Perrestrial: Grassland/Herbaceous	3.9
Antennaria flagellaris	Stoloniferous Pussytoes	Vascular Plant	Red	Perrestrial: Forest Needleleaf, Shrubland; Seepage Slope	33.9
Senecio integerrimus var. ochroleucus	White Western Groundsel	Vascular Plant	Red	Perrestrial	7517.0
Castilleja cusickii	Cusick's Paintbrush	Vascular Plant	Unknown	Perrestrial: Temporary Pool	3.1
Chenopodium atrovirens	Dark Lamb's-quarters	Vascular Plant	Unknown	Perrestrial: Woodland Needleleaf, Savanna	3.1

Carex vallicola	Valley Sedge	Vascular Plant	Yellow	Perrestrial: Forest Needleleaf, Grassland/Herbaceous	12.5
Melanerpes lewis	Lewis's Woodpecker	Vertebrate Animal	Blue	Perrestrial: Forest Needleleaf	1.4
Chrysemys picta pop. 2	Painted Turtle - Intermountain - Rocky Mountain Population	Vertebrate Animal	Blue	Lacustrine: Shallow Water	2.4
Melanerpes lewis	Lewis's Woodpecker	Vertebrate Animal	Blue	Perrestrial: Roadside; Cropland/Hedgerow	13.7
Catostomus platyrhynchus	Mountain Sucker	Vertebrate Animal	Blue	Riverine: Medium River, High Gradient	18.1
Sphyrapicus thyroideus	Williamson's Sapsucker	Vertebrate Animal	Blue	Perrestrial: Forest Mixed, Snag/Hollow Tree	27.7

3.2.7 OTHER RESOURCE VALUES

The Kettle Valley Railway, opened in 1915 but more recently converted to a multi-use recreation trail, runs through Princeton. This feature brings in tourists to Princeton and the surrounding areas and provides residents with a valuable recreation feature.

Rockridge Canyon, a private year-round family and youth facility, is located approximately eight kilometers south of Princeton and is part of Princeton FD's FPA (via contract). This facility can have up to 500 persons on-site per day in the summer which significantly increases the number of people to evacuate from the community in the event of a threatening wildfire. Other resource values are shown below on Map 3.



Map 3: Cultural, Environmental, and Other Resource Values.

SECTION 4: WILDFIRE RISK ASSESSMENT

This section summarizes the factors that contribute to local wildfire risk in the Princeton 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 X 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:

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

4.1 WILDFIRE ENVIRONMENT AND FIRE HISTORY

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

The Biogeoclimatic Ecosystem Classification (BEC) system classifies the province into zones by vegetation, soils, and climate. Regional subzones are derived from relative precipitation and temperature. Princeton's WUI is characterized by the BEC subzones and variants outlined below in Table 10.

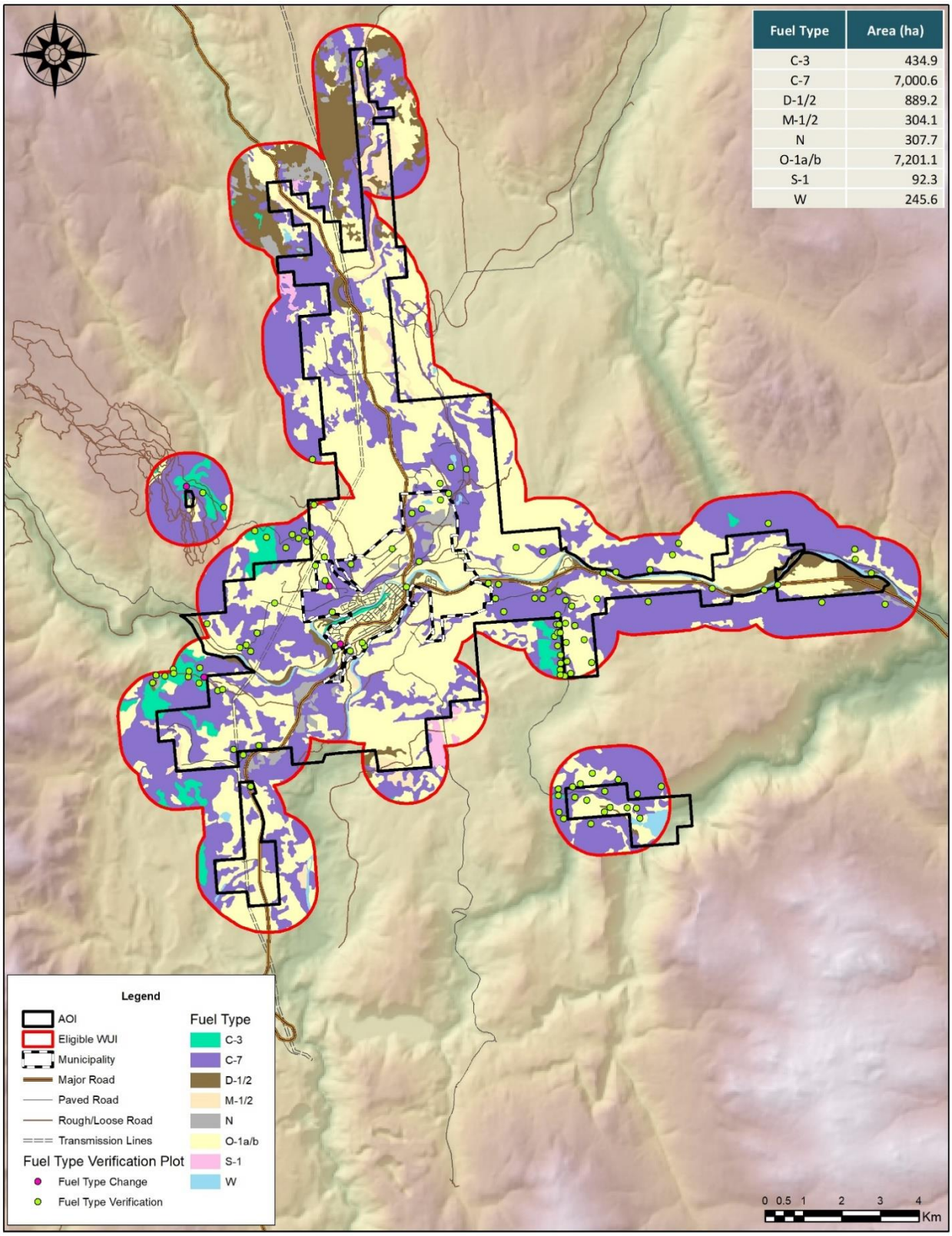
Table 10: BEC zones, subzones, and variants found within the WUI

Biogeoclimatic Zone	Area (ha)	Percent of WUI (%)
IDFdk1: Interior Douglas-fir, Dry Cool	1,228	7%
IDFdk2: Interior Douglas, Dry Cool	877	5%
IDFxh1: Interior Douglas-fir, Very Dry Hot	8,492	52%
IDFxh1a: Interior Douglas-fir, Very Dry Hot	1,143	7%
PPxh1: Ponderosa Pine, Very Dry Hot	2,184	13%
PPxh1a: Ponderosa Pine, Very Dry Hot	2,551	15%

Overall, Princeton's WUI is dominated by differing variants of dry Interior Douglas-Fir (IDF) BEC subzones (approximately 71%) which are located on the forested slopes above the grassy lower valleys and associated benches of the Ponderosa Pine (PP) BEC zone. However, several decades of fire exclusion has caused many PP and IDF stands to fill in with young conifers resulting in fuel accumulations, increased probability of crown instead of surface fires, loss of understory forage, and forest health issues.[21] The most notable forest health issue affecting Princeton's WUI has been tree mortality from the mountain pine beetle. Since the year 2000, almost 7,000 ha of forest land within the WUI has been affected by it (approximately 42% of the land base), leading to increased amounts of surface fuel accumulation in those affected stands.

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.[22] Fuel types (confirmed or updated by field work verification) for Princeton's WUI are shown below on Map 4. The fuel types present that may be considered hazardous in terms of fire behaviour and spotting potential in the WUI are C-3 and C-7, particularly if there are large amounts of woody fuel accumulations or denser understory ingrowth. C-5 fuel types have a moderate potential for active crown fire when wind-driven. An M-1/2 fuel type can sometimes be considered hazardous, depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory, as well as those in the understory. An O-1b fuel type often can support a rapidly spreading grass or surface fire capable of damage or destruction of property, and jeopardizing human life, although it is recognized as a highly variable fuel type dependent upon level of curing.[23] Detailed fuel type descriptions and their associated wildfire risk can be found in Appendix A-1: Fire Risk Threat Assessment Methodology.

[21] Province of British Columbia, 1995. Biodiversity Guidebook.
[22] Forestry Canada Fire Danger Group. 1992. Development and Structure of the Canadian Forest Fire Behavior Prediction System: Information Report ST-X-3.



Map 4: Fuel types present in Princeton's WUI (updated)

Weather

It is important for the development of appropriate prevention programs that the average exposure to periods of high fire danger is determined. 'High fire danger' is considered as Canadian Forest Fire Danger Rating System (CFFDRS) Danger Class ratings of 4 (High) and 5 (Extreme). Danger class days were summarized to provide an indication of the fire weather in Princeton's WUI. Considering fire danger varies from year to year, historical weather data can provide information on the number and distribution of days when the WUI is typically subject to high fire danger conditions, which is useful information in assessing fire risk.

Figure 1 below displays the average frequency of danger class days between the months of April and October. The data summarized comes from the August Lake BCWS weather station, which is located just east of August Lake along Willies Ranch Road (approximately 5.0 kilometers southeast of Princeton), and provides a 10-year fire weather data collection interval for the WUI. According to Figure 1, fire weather in the WUI is the highest from July to September. 47 of the 92 days (51%) over those three months are either 'high' or 'extreme' danger class days. August has the most severe fire weather: it has both the most 'high' or 'extreme' danger class days, 17 'high' and four 'extreme'. There are historically 2 to 5 'high' danger class days each in May, June, and October, demonstrating the potential for ignitions during warm and dry periods in the spring and fall.

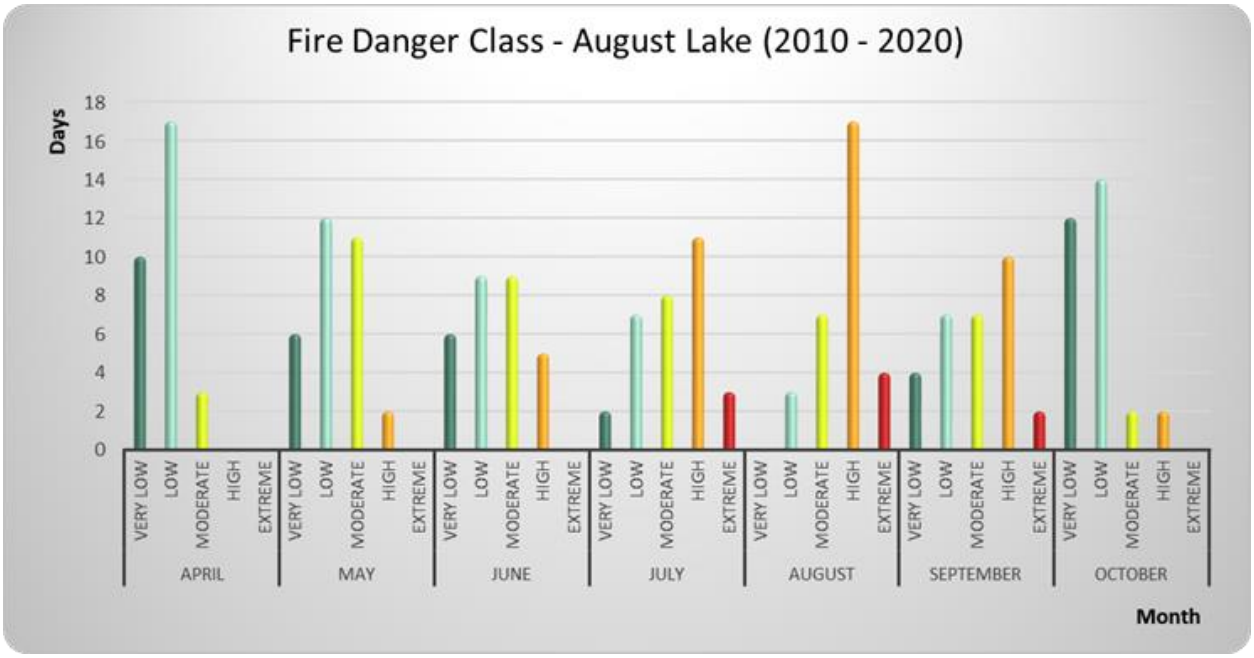


Figure 1: Average number of danger class days for the August Lake fire weather station. Summary of fire weather data for the years 2010-2020.

Climate Change is projected to contribute to changes in the fire regime, forest attributes, and fuel hazard across BC. Climate scientists expect that the warming global climate will trend towards wildfires that are increasingly larger, more intense, and more difficult to control. Furthermore, it is likely that these fires

will be more threatening to WUI communities due to increased potential fire behaviour, fire season length, and fire severity.[24]

Wind speed, wind direction, and fine fuel moisture condition also influence wildfire trajectory and rate of spread. Summarized in an Initial Spread Index (ISI) Rose(s) from representative BCWS weather stations, the Initial Spread Index (ISI) is a numeric rating of the expected rate of fire spread that combines the effects of wind speed and fine fuel moisture. Wildfire that occurs upwind of a value poses a more significant threat to that value than one which occurs downwind. The local representative BCWS weather station for the WUI is August Lake, located approximately 5 km southeast of downtown Princeton. During the fire season (April – October) predominant winds originate from the southeast, becoming more dominant in August and September (see Appendix A-3: Fire Spread Patterns for the August Lake ISI wind roses) – thus fires south of Princeton and values pose the largest threat to the town itself.

Topography

Slope percentage (steepness) influences a fire's trajectory, rate of spread, and ability to gain momentum uphill. Table 11 shows the percent of the WUI by slope percent class and those classes fire behavior implications. Approximately half of Princeton's WUI (55%) is on less than 20% slope and will likely not experience accelerated rates of spread. 15% of the WUI is likely to experience an increased rate of spread, 9% a high rate of spread, and 20% is likely to experience a very high or extreme rate of spread.

Table 11. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of WUI	Fire Behaviour Implications
<20%	55%	Very little flame and fuel interaction caused by slope, normal rate of spread.
20-30%	15%	Flame tilt begins to preheat fuel, increase rate of spread.
30-45%	9%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
40-60%	11%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	9%	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 1/3 of a steep slope (>40%) will be exposed to fires downslope travelling very quickly uphill towards it. Table 12 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 1/3 of the slope would be impacted by preheating and faster rates of spread. On the larger topographic scale, residential developments in the WUI would be considered bottom of the slope or valley bottom.

[24] BC Provincial Government. 2020. Preliminary Strategic Climate Risk Assessment. Retrieved from: https://www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/risk-assessment

Table 12. Slope Position of Value and Fire Behaviour Implications.

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

4.1.2 WILDFIRE HISTORY

Historic Fire Regime

BEC zones have been used to classify BC into five Natural Disturbance Types (NDTs). The NDT classification is based on the frequency and severity of pre-European disturbance events (including, but limited to, wildfires) and provides an indication of historical fire regime.[25]

Princeton's WUI is entirely characterized as being NDT 4 – ecosystems with frequent stand-maintaining fires. These ecosystems would normally experience frequent, low- to mid-intensity fires that remove surface fuel and understory vegetation and maintain larger, fire-resistant trees.[26] On grasslands, these fires would limit the encroachment of trees and shrubs. Variable intensity and frequency of these types of fires across the landscape create mosaics of uneven-aged forests and grassy or shrubby openings. The mean surface fire return interval for the NDT4 historically ranged from 4 to 50 years, with crown fires occurring every 200 years or more.[26] While natural disturbance regimes are useful for describing the historical disturbance pattern typical for an area, fire history is complex and highly variable across space and time for many ecosystems.[27]

Historical Wildfire Occurrences

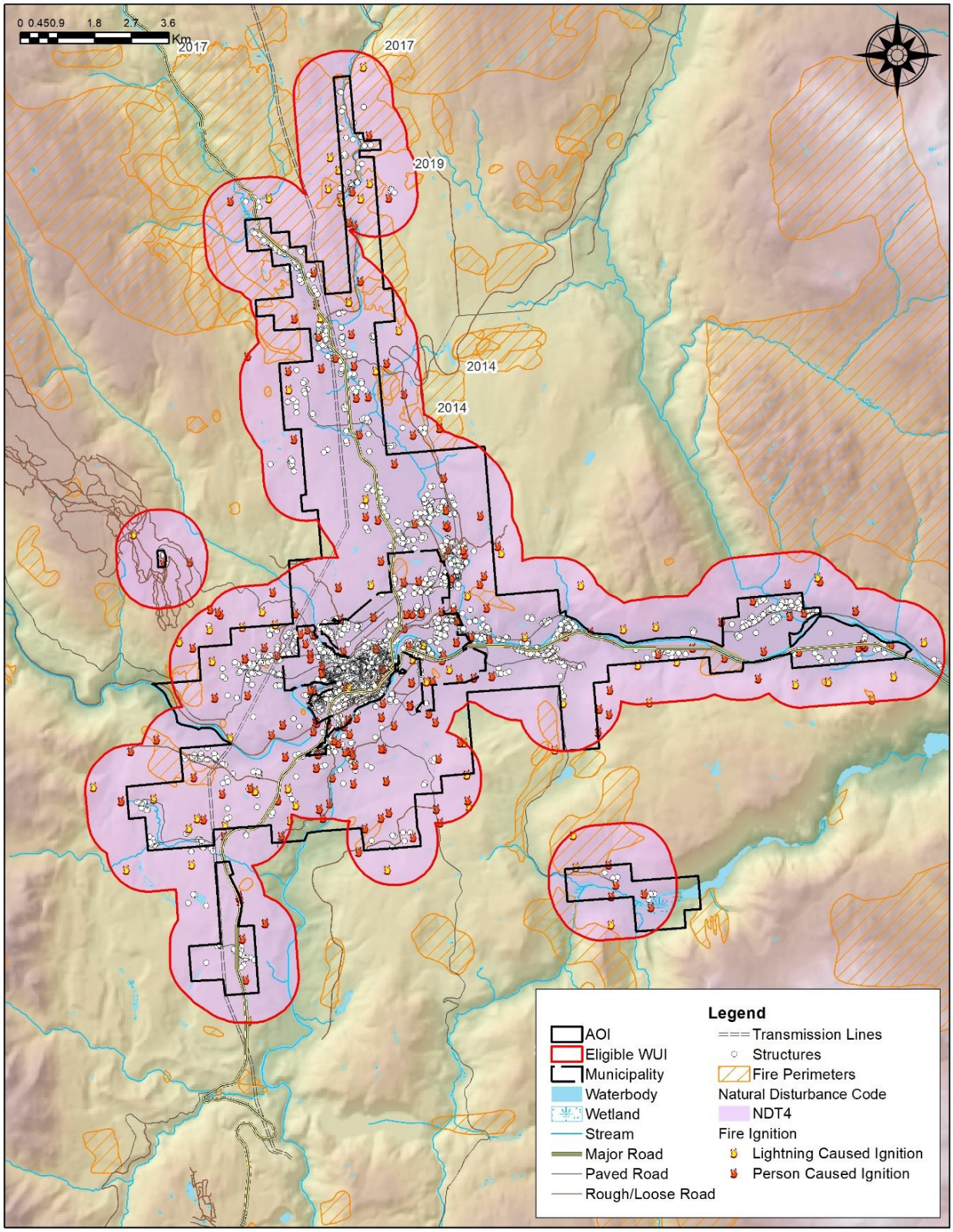
Historical fire ignition and perimeter data for the WUI are depicted below in Map 5. Fire ignition data is available from 1950-2020 and fire perimeter data is available from 1919-2020 for the WUI.

Based on the BCWS historical wildfire polygon dataset, wildfires in the WUI are relatively frequent and can be large – approximately 15% of the total area within the WUI has burned in the last 100 years with 10 of 36 fires during that time growing larger than 100 ha, with two of those growing over 8,000 ha. The most recent fire overlapping the WUI occurred in 2019 and burned 11.4 hectares. In 2017, an almost 3,200

[25] Province of British Columbia, 1995. Biodiversity Guidebook.
[26] Pogue, L. A., and L. Daniels. 2017. Three Centuries of Fire at Vaseux Lake. MASC Executive Summary for the BC Community Forests Association.
[27] Hall, E. 2010. Maintaining Fire in British Columbia's Ecosystems: An Ecological Perspective. Report submitted to the Wildfire Management Branch, Ministry of Forests and Range.

ha fire burned across the northern part of the WUI in the Summers Creek Road area that caused the rural community to be placed under evacuation order and Highway 5A to be closed.

Based on the BCWS historical fire ignition dataset, most historical ignitions with the WUI are human caused – out of 588 ignitions in the dataset, 82% (480) were from human or human activity. From 1950-1980, there was an average of 104 human-caused fires recorded per decade. From 1990-2010, there was an average of 28 human-caused fires per decade. 2010-present has recorded only six. This shows a clear trend of decreasing human-caused fires in the WUI on a per decade basis. This could be attributed to increased wildfire knowledge and the reduced use of fire to clear landscapes and forest slash (which can result in fire escapement). However, human caused fires still pose a substantial risk to Princeton and the surrounding WUI.



Map 5: Natural disturbance regimes and historical fire ignitions and occurrences within the WUI

4.2 PROVINCIAL STRATEGIC THREAT ANALYSIS

The BCWS Provincial Strategic Threat Analysis (PSTA) evaluates multiple datasets to provide a coarse (high-level) spatial representation of approximate relative wildfire risks across BC. It provides a starting point to assess the local wildfire risk. Three inputs are combined using a sum process to create the PSTA wildfire risk analysis component:[28]

1) **Historic fire density** represents the ignition and fire spread potential based upon historic patterns and fire density weighted by fire size (larger fire perimeters were given a higher weight in order to reflect the greater cost and damage usually associated with larger fires).
2) **Spotting impact** represents the ability of embers or firebrands from a burning fire to be sent aloft and start new fires in advance of the firefront, or outside of the fire perimeter. Spotting is most associated with high intensity crown fires in coniferous fuels and structure losses. For the wildfire risk analysis, the spotting analysis is based on estimating the threat to a given point on the landscape from the fuels surrounding it, up to two kilometers. Spotting distances greater than two kilometers are rare and unpredictable.
3) **Head fire intensity (HFI)** represents the intensity (kW/m) of the firefront. HFI is correlated with flame length and fire behaviour. The greater the fire intensity (kW/m), or HFI and fire intensity class, the more extreme the fire behaviour is likely to be and the more difficult the fire will likely be to suppress. The HFI used in the wildfire risk analysis was developed using the 90th percentile fire weather index value.

The final wildfire risk analysis value was developed through an average weighting process of the three layers.[29] The weighting system integrates the three components of fire threat: fire occurrence, represented by fire density; suppression effort and fire impacts, represented by head fire intensity; and spotting. Values were then separated into 10 classes (1 – 10) which represent increasing levels of overall fire threat (the higher the number, the greater the fire threat); threat class 7 is considered the threshold. Threat classes of 7 and higher are locations where the threat is severe enough to potentially cause catastrophic losses in any given fire season, when overlapping with values at risk. Classes were grouped into the following general threat class descriptions: low (1 – 3); moderate (4 – 6); high (7 – 8); and, extreme (9 – 10).

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

- Limited accuracy and variability of the fire history point data;

[28] MFLNRORD, BCWS. 2021. BC Wildfire PSTA Fire Threat Rating. Retrieved from: https://catalogue.data.gov.bc.ca/dataset/bc-wildfire-psta-fire-threat-rating

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

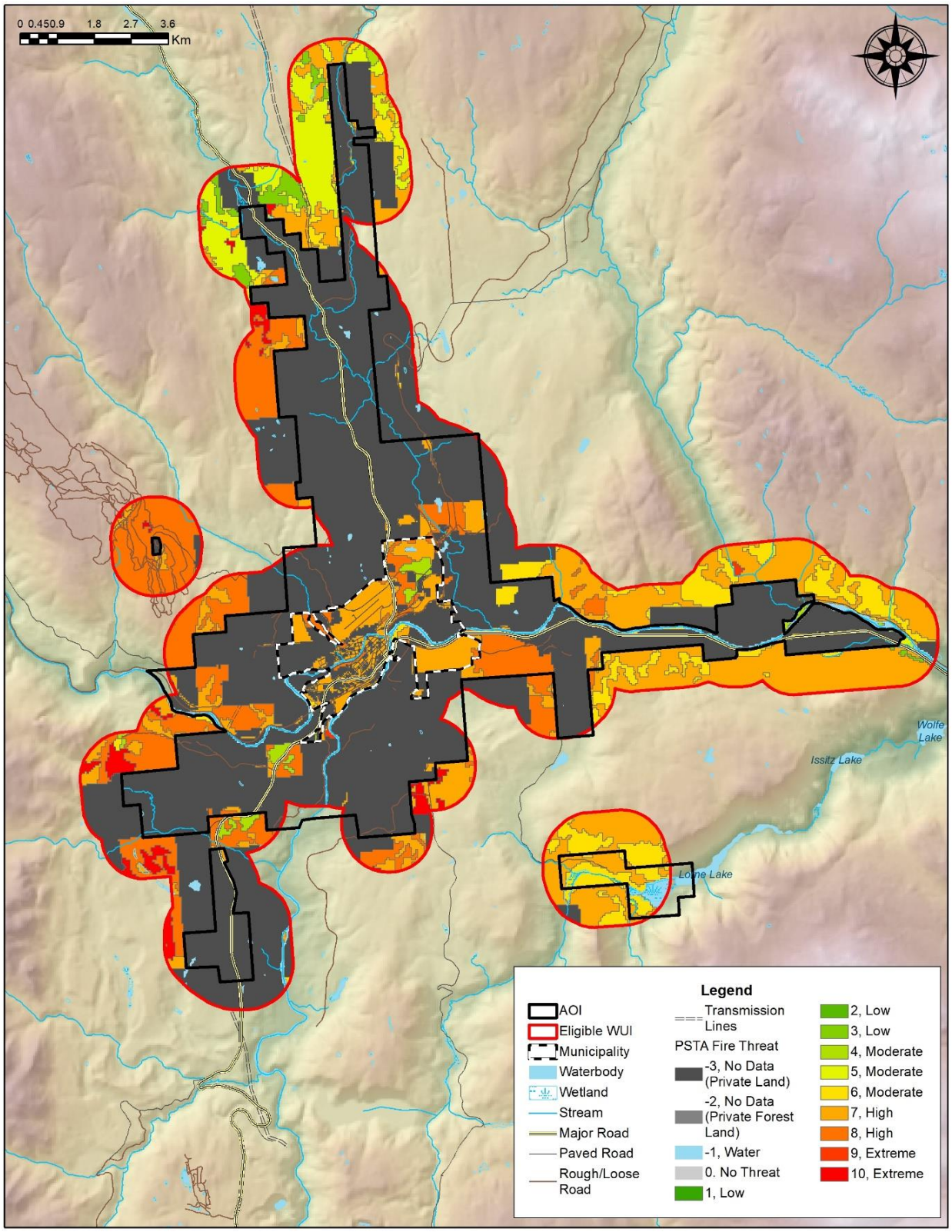
- Sensitivity to fuel type and the associated limitations of using fuel type approximations for fire behaviour modelling; and,
- 90th percentile rating for HFI, which represents a near worst-case scenario which may be artificial in some circumstances.

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

The fire threat ratings from the 2020 PSTA are summarized for the WUI in Table 13 and spatially illustrated in Map 6. Just over half of the WUI (56%) is categorized as private land and has no data for wildfire risk in the PSTA dataset. Low threat and water rating areas cover 2.4% of the WUI. Approximately 10% of the WUI is categorized as having a moderate wildfire risk rating. High and extreme threat rating covers almost 1/3 (32.2% of the WUI), with the most notable high-threat areas being concentrated around RockRidge Canyon, the Princeton golf course, the eastern portion of the Princeton FD FPA and WUI, and China Creek (west portion of the WUI).

Table 13: 2020 PSTA WUI Fire threat ratings

Threat Class	Area (ha)	Threat Class Description	Percent of WUI
-3	9,200.8	No Data (Private Land)	55.8%
-2	-	No Data (Private Managed Forest Land)	0%
-1	255.4	Water	1.6%
0	-	No Threat	0%
1	-	Low	0.8%
2	0.1		
3	127.7		
4	115.6	Moderate	9.6%
5	567.9		
6	902.5		
7	3,175.4	High	30.9%
8	1,921.3		
9	10.1	Extreme	1.3%
10	198.6		
Total	**16,475.5**	-	**100%**



Map 6: PSTA fire threat map

4.3 LOCAL 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: Fire Risk Threat Assessment Methodology, Map 4).
- *Consideration of the proximity of fuel to the community* – recognizing that fuel closest to the community usually represents the highest hazard (Appendix A-2: 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-3: 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.
- *Stratification of the WUI* – according to relative wildfire threat based on the above considerations, other local factors, and field assessment of priority wildfire risk areas.

WUI Threat Assessments were completed over a number of field days in December of 2020 in conjunction with verification of fuel types (see Appendix C: Wildfire Risk Assessment – Worksheets and Photos 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.

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 28 WUI threat plots were completed and 366 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the WUI (see Appendix F: WUI Threat

Plot Locations and Map 7) in areas that had road or trail access in order to build the most accurate assessment of local fire risk possible.

Using the verified and updated fuel types (Appendix A-1: Fire Risk Threat Assessment Methodology, Map 4) combined with field wildfire threat assessments and office-based analysis (Appendix A: Local Wildfire Risk Process), local wildfire threat for the WUI was updated. Using the Wildfire Threat Assessment methodology,[30] there are two main components of the threat rating system: the *wildfire behaviour threat class* (fuels, weather, and topography sub-components) and the *WUI threat class* (structural sub-component).

4.3.1 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; and
- 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 7 and in Table 14 below. The updated analysis shows that 54.5% of the WUI is classified as private land and as such has not been allocated fire threat data. 8% of the WUI is either water, very low threat, or low threat. *The remaining 38% of the WUI is moderate threat or higher, with high and extreme threat classes constituting 19%.* Table 14 also shows the differences between the 2020 PSTA data and the updated PSTA data resulting from the methodology.

Table 14: Fire behavior threat summary for the WUI

Wildfire Behaviour Threat Class	2020 PSTA Data	2020 CWRP Data Update
	% of WUI	% of WUI
Extreme	1.3%	6.3%
High	30.9%	12.5%
Moderate	9.6%	18.7%
Low	0.8%	6.7%
Very Low/ No Threat (Water)	1.6%	1.4%

[30] UBCM. 2013. Wildland Urban Interface Threat Assessments in BC. Retrieved from: (https://www.ubcm.ca/assets/Funding~Programs/LGPS/SWPI/Resources/swpi-WUI-WTA-Guide-2012-Update.pdf

Wildfire Behaviour Threat Class	2020 PSTA Data	2020 CWRP Data Update
	% of WUI	% of WUI
No Data (Private Land and Private Managed Forest Land)	55.8%	54.5%

4.3.2 WUI THREAT CLASS ANALYSIS

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

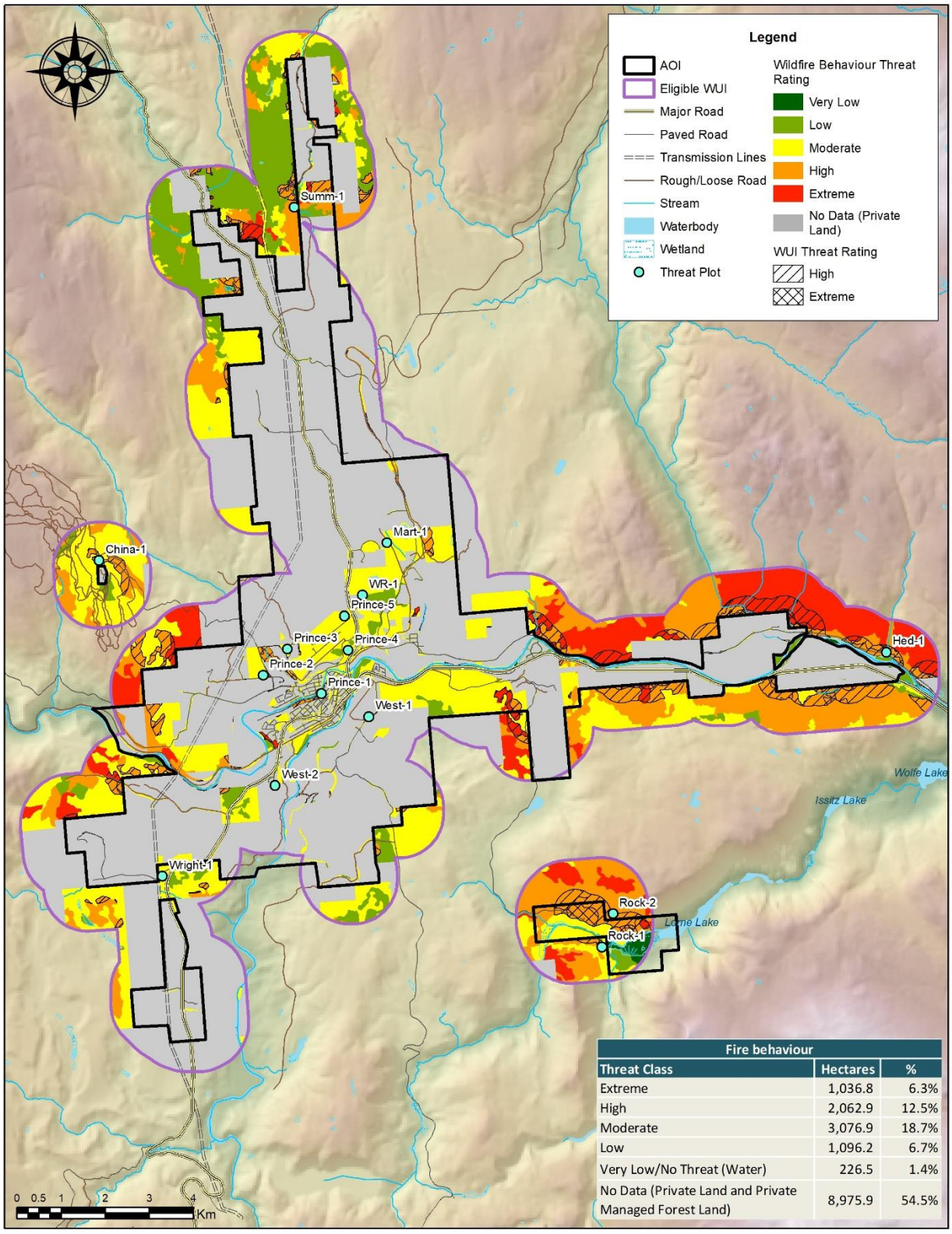
- **Low**: The high or extreme threat is sufficiently distant from developments, having no direct impact of the community and is located over 2Km from structures;
- **Moderate**: The high or extreme threat is sufficiently distant from developments, having no direct impact of the community and is located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

Table 15 below (and also displayed on Map 7) summarizes the WUI threat class ratings within Princeton's WUI. 160 hectares have an extreme threat class rating, 725 hectares have a high threat class rating, and 2,215 hectares have a moderate threat class rating.

Table 15: WUI threat class ratings

WUI Threat	
Threat Class	**Area (ha)**
Extreme	160.3
High	724.8
Moderate	2,214.6
Low	-

For detailed field data collection and spatial analysis methodology for the local threat assessment and classification, see Appendix H: Fire Risk Threat Assessment Methodology.



Fire behaviour		
Threat Class	Hectares	%
Extreme	1,036.8	6.3%
High	2,062.9	12.5%
Moderate	3,076.9	18.7%
Low	1,096.2	6.7%
Very Low/No Threat (Water)	226.5	1.4%
No Data (Private Land and Private Managed Forest Land)	8,975.9	54.5%

Map 7: Local fire behaviour

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 that can augment the PSTA, particularly regarding critical infrastructure.[31] Updated critical infrastructure locations ('values at risk') were used to prioritize field data collection for the Local Wildfire Threat Analysis conducted above in Section 4.3. Additionally, critical infrastructure assessments, changes to values at risk within the WUI, and changes to wildfire risk and consequences within the WUI are addressed in their respective FireSmart sections below.

[31] CRI FCFS 2021 SCRP Supplemental Instruction Guide

SECTION 5: FIRESMART PRINCIPLES

FireSmart® is the comprehensive nationally accepted set of principles, practices, and programs for reducing losses from wildfire.[32] The FireSmart approach and concepts, including recommended FireSmart guidelines,[33] have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000; FireSmart has become the de facto Canadian standard. FireSmart is founded in standards published by the National Fire Protection Association (NFPA). FireSmart includes seven disciplines: education, legislation and planning, development considerations, interagency cooperation, cross-training, emergency planning, and vegetation management. Together, these disciplines provide a sound framework for reducing wildfire risk to communities.

The overarching goal of FireSmart is to encourage communities and citizens to adopt and conduct practices to mitigate the negative impacts of wildfire to assets on public and private property. While responsibility for effectively mitigating hazards must be shared between many entities including homeowners, industry, businesses, and governments,[34] the ultimate root of the WUI interface problem is the vulnerability of structures and homes to ignition during wildfire events, in particular vulnerability to embers. This leads to an emphasis on risk mitigations on private properties. Findings from an investigation of how homes survived or ignited during the Fort McMurray 2016 Horse River wildfire indicate that the vast majority of initial home ignitions in the WUI were caused by embers rather than direct contact by flames or radiant heat.[35] Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire risk surrounding them.

Over half of Princeton's WUI is private property - thus, FireSmart education, FireSmart building materials, and Home and Critical Infrastructure Ignition Zone vegetation management are the most important factors towards structures and homes surviving a wildfire event in Princeton and its greater WUI.

Most homes in Princeton's WUI are part of individual interface residential neighbourhoods. FireSmart compliance on private properties is generally low when considering building materials, landscaping, and maintaining a 10 m defensible space (where possible). Many homes lack setbacks from steep slopes, use wood construction for decking, fences, and siding, have planted cedar, juniper, and other volatile hedges, and store combustible items (firewood, propane cylinders) adjacent to the home and out-buildings. However, many structures within the WUI have Class A (high resistance to fire) roofing materials, which is a critical component of preventing structure ignition. Overall, the primary concern is the lack of

[32] FireSmart is the registered trademark held by the Partners in Protection Association.
[33] 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
[34] https://www.firesmartcanada.ca
[35] Westhaver, A. 2017. Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster. Institute for Catastrophic Loss Reduction (ICLR) research paper series – number 56.

defensible space structure-to-structure and structure-to-forest. A secondary concern is the ubiquity of flammable building and landscaping materials.

An evaluation of the current level of FireSmart implementation within Princeton's WUI is presented below in Table 16. All the activities listed are eligible for funding under the 2021 CRI FireSmart Community Funding and Supports program.

Table 16: FireSmart activities funded under the 2021 UBCM CRI program and their level of implementation in the WUI

FireSmart Discipline/CRI Funding Category	FireSmart Activities	Current Status
Education	Update public signage, social media, websites and/or newsletters	Princeton's website has a link to fire bans Wildfire risk signs are posted at major road entrances to Princeton
	Distribute FireSmart educational materials and resources	Not yet achieved
	Develop education for the reduction of local human-caused fires	Fire bans communicated to public by Princeton FD and the Princeton website
	Encourage community participation in Wildfire Community Preparedness Day Organize and/or host FireSmart events and workshops	Planned for 2020 but deferred due to COVID-19 pandemic
	Support neighbourhoods to apply for FireSmart Canada Neighbourhood Recognition Program	Not yet achieved
	Offer FireSmart rebate program	Not yet achieved (See Recommendation 25)
Legislation and Planning	Develop or amend a CWRP/CWPP	2006 Princeton CWPP and 2020 CWRP RDOS 2020 CWPP
	Develop FireSmart polices for the design and maintenance of public land, such as regional parks, or buildings	Not achieved
	Conduct FireSmart Assessments for publicly owned buildings	FireSmart assessments were completed in 2020 using the LFR reporting documents
Development Considerations	Amend OCPs or bylaws to incorporate FireSmart principles	Partially achieved
	Revise zoning and development permit documents to include FireSmart considerations	Not achieved
	Establish Development Permit Areas for Wildfire Hazard	Not achieved

FireSmart Discipline/CRI Funding Category	FireSmart Activities	Current Status
	Include wildfire prevention and suppression considerations in the design of subdivisions	Not achieved
	Replace building materials (home and critical infrastructure) with fire-resistant materials	Partially achieved
	Amend referral processes for new developments to ensure multiple departments, including the fire department and/or emergency management personnel, are included	Not achieved
	Develop plans for residential areas: - Conduct HIZ assessments for individual properties - Develop FireSmart Neighbourhood Plans - Undertake Neighbourhood Wildfire Risk Assessments for neighbourhoods pursing FSCCRP	Not yet achieved
Interagency Cooperation	Develop, coordinate, and/or participate in a Community FireSmart Resiliency Committee or multi-agency fire and/or fuel management planning table	Princeton participates in the RDOS CFRC Princeton will have its own CFRC as part of this CWRP.
	Provide Indigenous cultural safety and humility training to emergency management personnel	Not achieved
	Attend 2021 FireSmart BC Conference, to be hosted by the BC FireSmart Committee	Princeton staff attended FireSmart workshops/conferences in 2020.
Cross-Training	Provide or attend training for Local FireSmart Representatives (LFR)	Achieved – members of the Princeton FD are trained LFR's
	Support LFRs to attend facilitator training	Not achieved
	Cross-train fire department members SPP-WFF1 Wildland Firefighter Level 1 S-100 Basic fire suppression and safety S-185 Fire entrapment avoidance and safety ICS-100	Annual cross-training with BCWS for S-100 Courses on wildfire behaviour and fire weather All Princeton FD personnel maintain SPP-WFF1 or S-100 training at minimum
	Professional development to increase capacity for FireSmart activities	Achieved, but should continue to grow capacity.
Emergency Planning	Develop and/or participate in cross-jurisdictional meetings and tabletop exercises focused on wildfire preparedness	Annual cross-training with BCWS ?

FireSmart Discipline/CRI Funding Category	FireSmart Activities	Current Status
	Assess structural protection capacity	All structural equipment checking weekly During fire season, all wildland equipment checked monthly All wildland equipment checked by BCWS annually
	Use and/or promote EMBC Wildfire Preparedness Guide for community emergency preparedness events focused on wildfire	Princeton's Evacuation Plan developed in 2020 and includes wildfire emergencies
Vegetation Management	Undertake fuel management on publicly owned land (fuel management prescriptions, treatments, maintenance, or prescribed burns)	Fuel management completed on five treatment units identified in the 2006 CWPP
	Remove or reduce flammable vegetation up to 100 m from critical infrastructure	Not yet achieved
	Provide vegetative debris disposal for homeowners Provide a dumpster or chipper Waive tipping fees	Yard waste, garden waste, and wood waste (also noxious weeds and infested vegetation) are free for disposal throughout the year at Princeton's refuse centre.

Princeton is a community divided into distinct neighbourhoods. For various reasons (funding amounts, available effort, etc.) FireSmart activities may not be able to cover them all. Based on general field observations (local wildfire threat assessment, current level of FireSmart, proximity to the WUI edge, restrictions to access/egress, adjacent fuel types and hazards, etc.), neighbourhoods within the WUI have been prioritized below in Table 17 by those that would benefit the most from FireSmart planning and activities. Additionally, the communities within Princeton FD's FPA, but outside Princeton's municipal boundary, are within scope of this CWRP, but Princeton otherwise has limited jurisdiction over them – Princeton should lobby the RDOS appropriately to prioritize FireSmart planning for these communities.

Table 17: Priority Neighbourhoods within the WUI

Princeton Municipal Neighbourhood and Priority Number	FireSmart Y/N	General Location
1: Westridge	N	Westridge Drive. Southwest of downtown Princeton on the east edge of Hwy 3.
2: Ridgewood	N	Ridgewood Drive. Southwest of downtown Princeton on the west side of Hwy 3.
3: Airport	N	Airport Road. North of downtown Princeton on the west edge of the airport.
3: Deerview and Bonlin Road	N	Deerview Crescent, Bonlin Road, West China Creek Road, and Hidden Valley Road. West of downtown Princeton and just west/southwest of the airport.

Princeton Municipal Neighbourhood and Priority Number	FireSmart Y/N	General Location
4: 3rd Bench	N	Downtown Princeton
5: 2nd Bench	N	Downtown Princeton
6: 1st Bench	N	Downtown Princeton
Princeton FPA Community and Priority Number	**FireSmart Y/N**	**General Location**
1: Old Hedley Road	N	Farms and homes scattered along Old Hedley Road extending ~13km east of Princeton.
2: Rockridge Canyon	N	Eight kilometers southeast of Princeton (14km driving via Willies Ranch Rd) and on the west edge of Lorne Lake.
3: West China Creek Road/China Creek Trails	N	9 kilometers northwest of Princeton via West China Creek Road.
4: Summers Creek Road	N	10 kilometers north of Princeton via Hwy 5A, and extending 15km more up Summers Creek along Summers Creek Road.
5: Seven Mile Road	N	11 kilometers north of Princeton via Hwy 5A, on the west edge of the highway.
6: Old Highway Road	N	8.5 kilometers north of Princeton via Hwy 5A, on the west edge of the highway.
7: Rainbow Lake Resort/Deer Valley Creek	N	4.0 kilometers northeast of Princeton via Princeton-Summerland Rd, on the east side of the main road around Rainbow Lake.
8: Sunflower Estates Road	N	3.5 kilometers north of Princeton via Hwy 5A, on the north side of the Swan Lake Conservation Area.
9: Black Mine Road	N	4.5 kilometers south of Princeton via Hwy 3, along Black Mine Road heading west off the Hwy.
10: Jacob Creek	N	15.5 kilometers southeast of Princeton via Old Hedley Rd.

5.1 EDUCATION

The goal of FireSmart education is to provide information to communities and citizens on how best to adopt and conduct practices to mitigate the negative impacts of wildfire to assets on public and private property. Princeton had received 2020 funding from UBCM CRI for workshops, but these were cancelled due to COVID-19 restrictions. FireSmart activities on private property and critical infrastructure were the number one recommendation provided by BCWS to Princeton during CFRC meetings

Table 18 below details actions and activities Princeton can implement to expand FireSmart education opportunities within its community. Of note is the FireSmart Canada Neighbourhood Recognition Program.[36] This program is a vehicle for FireSmart within neighbourhoods to be led by the residents themselves by utilizing the efforts of a 'Neighbourhood Champion' to organize a FireSmart Board, get the neighbourhood assessed by the Local FireSmart Representative, and have a FireSmart plan created for the residents to follow, all eventually leading to the neighbourhood gaining FireSmart Canada Recognition as a FireSmart Neighbourhood. It provides groups of residents with critical information and a means of organizing themselves to progressively alter hazardous conditions within their neighbourhood. The program also facilitates FireSmart knowledge and practices to quickly filter downwards onto the property of individual residents to further mitigate wildfire hazards at the single-home scale within the Home Ignition Zone.

[36] https://firesmartcanada.ca/programs-and-education/neighbourhood-recognition-program/

Table 18: Education recommendation and action items

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
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	High	Princeton and/or Local FireSmart Representatives should support and facilitate priority neighborhoods to self-organize to attain FireSmart Canada Neighbourhood Recognition Program (FSCNRP) status.	Leverage the leadership of a Local FireSmart Representative. Consider utilizing the local FireSmart rebate program or neighbourhood chipping opportunities (Section 5.7) as incentives.	Princeton (Local FireSmart Representatives)	5 years	Completed for priority neighbourhoods 1,2, and 3.	UBCM CRI funding available ($5000/ neighbourhood; 40 hours/ initiative)
2	High	Princeton should develop a FireSmart/Wildfire Preparedness page on Princeton's website (with a direct link from the opening webpage). Include links to FireSmart BC and other relevant wildfire resources. Promote this webpage through different media sources, including The Similkameen Spotlight newspaper.	Princeton's webpage already has a front-page button/link to fire bans. Amalgamate with a FireSmart link or place them side-by-side.	Princeton (Consultant)	1 year	Webpage updated	UBCM CRI funding available (~40 hours for set-up. Additional hours for updates as required)
3	High	Princeton, Princeton FD, and Local FireSmart Representatives should continue to promote FireSmart approaches for wildfire risk reduction to homeowners, businesses, and stakeholders within the Princeton FD FPA through FireSmart workshops, open houses, and/or presentations (*i.e.,* Wildfire Community Preparedness Day, Neighbourhood Champion Workshop), Farm and Ranch Wildfire Preparedness Workshop). Supply FireSmart resources during these engagement campaigns and promote the FireSmart Begins at Home mobile app as a method of conducting home assessments.	Aim to conduct the engagement and promotion campaign prior to and during the fire season. Include education specific to the Princeton community such as, emphasizing the importance of visible addresses and widened driveways for emergency response, safe debris removal methods, and FireSmart firewood storage. Provide information on FireSmart landscaping and exterior residential sprinklers as FireSmart prevention measures. *Princeton had received 2020 funding from UBCM CRI for workshops, but these were cancelled due to COVID restrictions. Consider moving workshops online as a work-around.*	Princeton (Princeton FD, Local FireSmart Representatives, Community Champions)	Yearly (pre-fire season)	50 participants per year	UBCM CRI funding available (~40 hours for planning and 1 day for workshop)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
4	Moderate	Princeton should encourage School District 58 to adopt and deploy existing wildfire education programs. Other options/value-added activities include consulting with Association of BC Forest Professionals (ABCFP) and BCWS (Kamloops Fire Centre) as well as the local fire department and regional FireSmart representatives to facilitate and recruit volunteer teachers and experts to help with curriculum development to be delivered in the schools (field trips, guest speakers, etc.).	Emergency preparedness curriculum is available provincially, which includes preparedness for a variety of natural hazards, including wildfire (Master of Disaster, FireSmart BC Education box).	Princeton	Yearly (pre-fire season)	One FireSmart education day per school year	UBCM CRI funding available (FireSmart BC Education box - $800 Junior K-Grade 12)
5	High	This CWRP report and associated maps should be made publicly available by Princeton through its website and on social media. In addition, this CWRP should be shared with local industry partners who may be interested in collaborating on FireSmart and wildfire risk reduction activities.	Include all member of the CFRC, as well as other relevant industry and businesses in the WUI (*i.e.,* Weyerhaeuser mill operations manager).	Princeton	1 year	Available for download or viewing on Princeton's webpage	Princeton
6	Medium	Additional signage of danger class rating, fire bans, and general fire safety related warnings should be posted as required in the WUI. Signs should be updated at least weekly during the fire season by a Princeton FD member or designate.	Tourism to Princeton and the surrounding region is at its peak during the fire season. It is important to ensure residents, vacation property owners, and visitors understand current fire bans and Danger Class Ratings.	Princeton (RDOS)	Yearly (on-going)	Current and accurate fire danger ratings posted on signs	Princeton and RDOS. (~$500/sign)
7	High	Apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. The rebate program is described in detail in the CRI Program 2020 FireSmart Community Funding and Supports – Program & Application Guide and must adhere to the goals and objectives of FireSmart. Before applying for funding, Princeton's resources available to execute the program should be reviewed. An LFR could be engaged to support the program.	Incentivize homeowners to FireSmart activities on their properties by allowing them to access partial rebates for, if rated as high or extreme risk in a FireSmart home assessment.	Princeton	2 years	Rebate program established and made known to residents in priority neighbourhoods (Table 17).	UBCM CRI funding available (~20-30 hours in-house)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
8	High	FireSmart Canada is releasing BC specific landscaping guidelines in 2021. When available, make these guidelines available on the Princeton FireSmart webpage and hand out pamphlets/literature relating to it to residents.	Increase FireSmart vegetation management knowledge amongst Princeton's residents.	Princeton (Local FireSmart Representatives, Community Champions)	1 year from when the guidelines are made available	Posted on Princeton's FireSmart webpage and handed out in priority neighbourhoods (Table 17)	UBCM CRI funding available (~ 20 hours in-house; no cost)
9	High	Provide outreach materials to encourage homeowners to complete a FireSmart home assessment using the Home Assessment guide or the FireSmart Begins at Home mobile app, though a Local FireSmart representative, or through the FireSmart Home Partners Program.	Educate homeowners of FireSmart principles and encourage residents to FireSmart homes.	Local FireSmart Representative (Mitigation Specialist, Community Champions)	2 years	Home assessments started within priority neighbourhoods (Table 17)	UBCM CRI funding available for LFR training and employment and public education materials

5.2 LEGISLATION AND PLANNING

A review and summary of Princeton's current by-laws relevant to wildfire risk and emergency planning was provided earlier in Section 2.4. Actions such as 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 (note: development requirements addressing minimum standards for access, water supply, construction materials and techniques, and vegetation management can also be implemented through a wildfire hazard Development Permit Area – which is proposed as part of this CWRP and discussed below in Section 5.3 Development Considerations)

When considered through a wildfire lens, Princeton's bylaws addressing solid waste management, smoking in public places, fireworks, and property maintenance appear adequate. The recently passed bylaw 997, 2021 (Town of Princeton Volunteer Fire Department Bylaw) is robust and fulfills almost all needs for addressing fire and wildfire risks, hazards, and mitigation on private and municipal land both within Princeton's municipal borders as well as outside it but within Princeton FD's FPA. Recommendations and action items Princeton can implement relating to legislation and planning are detailed below in Table 19.

Table 19: Legislation and planning recommendation and action items

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
Objective: provide the means for Princeton to implement wildfire risk reduction actions through by-laws and legislation by outlining local government responsibilities regarding wildfire.							
10	High	Complete or schedule periodic updates of the CWRP. The frequency of updates is highly dependent upon major changes which would impact local wildfire risk, or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWRP update should be initiated every 5 years.	A current (i.e., no more than 5 years old) CWRP is currently a requirement for further funding under the CRI Program.	Princeton (Consultant)	5-7 years from adopting this CWRP document	Princeton always has an up-to-date CWRP and action plan	UBCM CRI funding available (~$25,000 for full document / $10,000 for update)
11	High	Update bylaw 393, 1982 (Prohibit the Fouling or Contamination of the Atmosphere Bylaw) to include approved activities related to wildfire vegetation management and wildfire risk reduction.	Allows for prescribed burns and fuel treatments to be administered without contradicting the bylaw.	Princeton	2 years	Bylaw updated	UBCM CRI funding available (~20 hours in-house)

5.3 DEVELOPMENT CONSIDERATIONS

Embedding FireSmart practices and considerations into development should be a leading priority of Princeton. Factors that can be planned for (and regulated through the land use planning and development process) affecting public safety during a wildfire include:[37]

- 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.
- Lot size and structure density.
- Design guidelines and architectural standards.

Current hydrant coverage is available to all existing neighbourhoods and industrial areas within the Princeton's municipal border. As noted by the Fire Chief, water supply for the town is adequate, but water supply and access for areas outside the municipality but within the FPA are dependent on drafting from local rivers/creeks of which there are few locations to do so. Additionally, fire season coincides with low water flows, making some drafting sites unusable during these times. The result is Princeton FD having to shuttle water from municipal hydrants with turn-around times upwards of three hours if responding to a fire event at the further reaches of its protection area.

Figure 2: Westridge neighbourhood water pump and reservoir with highly flammable cedar hedging surrounding it (credit: M. Nederend, BA Blackwell & Associates Ltd)

Field assessments of CI identified several instances where the structure itself may not be susceptible to fire, but the vegetation surrounding it could be, creating a barrier to access if ignited and a vector for fire spreading to surrounding homes and through the community. One example is shown in Figure 2, the water pump station and reservoir for the Westridge neighbourhood located at the south end of Westridge Drive. The pump and reservoir structure itself is non-combustible (concrete) but the surrounding vegetation (cedar hedges) is highly flammable.

Princeton's Official Community Plan (OCP) provides a long-range framework to guide, monitor, and evaluate future land use and development. The objectives and policies within Princeton's OCP that are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster were previously summarized in Table 2. Much

[37] CRI FCSF 2021 CWRP Supplemental Instruction Guide

like regulations, it is important that that the OCP adopt language and framework *through a wildfire lens* so that future land use and development is guided with wildfire preparedness in mind. One of the most powerful tools Princeton can employ is the development of a Wildfire Hazard Development Permit Area (DPA) designating areas (of moderate, high, and extreme hazard threat rating) for the protection of development from hazardous conditions. The following aspects should be considered in the OCP review and wildfire hazard DPA development:

1) Establish DPA objectives (*e.g.,* minimize risk to property and people from wildfires, minimize risk to forested areas surrounding the municipality, and conserve the visual and ecological assets of the forests surrounding communities, etc.).
2) Where possible, it is recommended to mandate FireSmart construction materials, some of which may be beyond BC Building Code within the established wildfire hazard development permit area.
3) Engage the development community in the DPA development process to educate, inform, and allow for input. This can be accomplished in a variety of formats, including, but not limited to, workshops, informational sessions, or open houses.

Recommendations and action items that Princeton can implement to embed FireSmart practices and considerations into development are detailed below in Table 20.

Table 20: Development considerations recommendation and action items

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
Objective: embed FireSmart practices and considerations into all development within Princeton.							
12	High	Develop a wildfire hazard DPA and update Princeton's Official Community Plan (OCP) with respect to it when completed. To meet objectives, consider including the following elements: • minimum setbacks from forested edges based on FireSmart, • fuel management based upon qualified professional recommendations, • landscaping to FireSmart guidelines, • building materials and design based on NFPA 1144 and FireSmart standards, • underground servicing, • prompt removal of combustible construction materials or thinning/fuel management waste, and • a minimum of two access/evacuation routes for all neighbourhoods.	Embed FireSmart values into all aspects of community development and planning.	Princeton (Consultant)	5 years	Interface wildfire DPA created and adopted	UBCM CRI funding available (~25,000 and 40 hours in-house)
13	Moderate	OCP: amend section *11.1.9 (.1–.5) Policies to Engage and Protect the Community – General*: *Fire Hazards* to include the potential impact wildfire may have on public health and safety, ecosystems, habitat, and water quality among other values.	Embed community FireSmart values in the OCP to guide future development. See the Fraser Valley Regional District Electoral Area D OCP Update,[38] the Cariboo Regional District Electoral Area G OCP[39] and other regional district electoral areas as examples.	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available (~$10,000 and 20 hours in-house)
14	High	OCP: amend section *5.2.2 Land Use Policies – General Residential* to include a review of hydrant	Include language specifying what constitutes acceptable access for	Princeton	5 years	OCP section amended	UBCM CRI funding available

[38] Fraser Valley Regional District. 2018. *Official Community Plan for Popkum-Bridal Fall Bylaw No. 1502, 2018*. Retrieved from: https://www.fvrd.ca/assets/Services/Documents/Planning~and~Development/Projects~and~Plans/Popkum~Bridal~Falls~OCP~Update/Area%20D%20Bylaw%201501%202nd%20Reading.pdf

[39] Cariboo Regional District. 2018. *Lac La Hache Area Official Community Plan Bylaw No. 5170*. Retrieved from: https://www.cariboord.ca/en/business-and-development/resources/Documents/PlanningandDevelopment/OCP/LacLaHacheAreaOCP/Lac_La_Hache_Area_OCP.pdf

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
		and water access by the Princeton FD and that two points of access/egress be included in all new developments.	firefighting vehicles and to include a fire access route "that has been inspected or approved by the local fire department (or other applicable professional)."	(Consultant)			(~$10,000 and 20 hours in-house)
15	High	OCP: amend *section 5.10.5 Land Use Policies – Industrial* to include FireSmart landscaping as part of, "appropriate buffering and screening through landscaping such as tree retention, supplementary planting…."	Add reference to FireSmart landscaping guidelines/standards, the Home Ignition Zone, and the Critical Infrastructure Ignition Zone.	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available (~$10,000 and 20 hours in-house)
16	High	OCP: amend section *5.10.11 Land Use Policies – Industrial* to include FireSmart principles (vegetation, landscaping) as part of, "restoring the landscape upon completion of the operations."	Add reference to FireSmart landscaping guidelines/standards, the Home Ignition Zone, and the Critical Infrastructure Ignition Zone. Recommendation #25 applies to this on all Crown lands.	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available (~$10,000 and 20 hours in-house)
17	High	OCP: amend section *7.1 (.1 - 5, .6) Visual Quality and Aesthetics Policies – General* and section *8.1 (.1-.5) Healthy and Active Living Policies –Parks* to consider park, public space, and trail acquisition and maintenance through a wildfire lens. This will help ensure wildfire risk, mitigation, liability, and future maintenance are considered as priorities in development of the parks and trails inventory, including consideration for long-term maintenance costs and access. Include the requirement for a qualified professional to review and assess the siting of parks and park access prior to acceptance into Princeton's Park inventory.	Trail building and maintenance and park and open space maintenance activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (through proper placement, emergency access and evacuation, clean-up of combustible fuels trailside, and work practices).	Princeton (Consultant)	5 years	OCP section amended	UBCM CRI funding available (~$10,000 and 20 hours in-house)
18	Moderate	Existing single access neighbourhoods should be reassessed for potential secondary access/evacuation routes. There could be opportunities for an easement or agreement-on-use on the edge of an individual's private property for a single lane gravel road that could create the required secondary evacuation route for a	It is recognized that most of these neighbourhoods are older and surrounding private property can make this difficult. Opportunities are possible by contacting BC Hydro/Fortis BC and discuss using parts of the existing right-of-way access roads or forest land	Princeton (Consultant)	5 years	Where determined possible, secondary egress routes are being	Princeton ($ variable: location specific)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
		neighbourhood (to be used only in emergency evacuation situations).	managers and using resource roads as emergency evacuation routes.			planned for development	
19	High	Engage a qualified professional (such as a Local FireSmart Representative) to complete formal FireSmart assessments of critical infrastructure. Plan and implement action items in sequence of CI importance.	CI such as fire halls, emergency shelters, and water infrastructure are identified in Table 8.	Princeton (Local FireSmart Representative)	2 years	Assessments completed and action items being planned for	UBCM CRI funding available (~$1000 per CI)
20	High	Use fire-resistant construction materials, building design and landscaping for all CI when completing upgrades or establishing new infrastructure.	Vegetation setbacks around CI should be compliant with FireSmart principles (*e.g.,* no combustible material within 10 m of structures).	Princeton	Ongoing	New CI are FireSmart	Princeton ($ variable: CI specific)
21	High	Develop a landscaping standard which lists flammable, non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard.	Consider including the landscaping standard as part of the wildfire hazard DPA, as well as making it publicly available for residents and homeowners outside of the DPA. *FireSmart Canada is releasing BC specific landscaping guidelines in 2021 that can be used instead of creating Princeton-specific ones.*	Princeton	3 years	Landscaping standard created (or adopted) and built into the interface wildfire DPA	Princeton; UBCM CRI funding available ($0 if using FireSmart Canada guidelines; ~20 hours in-house)
22	High	All new developments outside of existing water service areas should have a water system which meets or exceeds minimum standards of NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting.	Princeton FD should also review the planned water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs.	Princeton	Ongoing	New development water standards meet NFPA 1142 Standard on Water Supplies for Suburban and Rural Fire Fighting.	Princeton ($ variable: location specific)
23	Moderate	Princeton should conduct a water supply vulnerability assessment to determine potential supply issues.	This assessment could include an analysis of the vulnerability of water supply infrastructure to wildfire and/or mass wasting events.	Princeton (Consultant)	5 years	Assessment completed	UBCM CRI funding available

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
							($2000 for assessment)
24	High	Explore opportunities to enhance water access/drafting sites for Princeton FD (and wildland firefighters) in the FD's rural fire protection areas. Opportunities include building permanent cisterns on the edge/near known accessible drafting sites that are gravity fed and covered to reduce evaporation during fire season.	This will likely involve multiple jurisdictions and entities including Princeton FD, BCWS, RDOS, FLNRORD and multiple professional assessments (engineering, riparian, biology)	Princeton (BCWS, RDOS, FLNRORD, Consultant)	5 years	New drafting sites located	Princeton (no estimate)

5.4 INTERAGENCY COOPERATION

Identifying and linking stakeholders such as government, private landowners, park and recreation staff/managers, forest land managers, and emergency services can reduce wildfire risk, increase UBCM funding opportunities, and allow Princeton to obtain valuable local knowledge.

Community FireSmart Resiliency Committee (CFRC)

The RDOS has an existing CFRC (established through its recent 2020 CWPP), of which Princeton is an active member. Thus, with the RDOS's CFRC already operating with member groups from across the District, the CFRC for Princeton reflects the key planners and responders most involved in local FireSmart, wildfire resiliency planning, and wildfire and emergency response specific to Princeton (and for all intents and purposes could be considered a "sub-committee" of the RDOS's CFRC). Table 21 below details the agencies involved, their current representatives and titles, and their role within Princeton's CFRC.

Table 21: Princeton's Community FireSmart Resiliency Committee (CFRC)

Agency	Title	Person[40]	Role	Comments
Town of Princeton	Manager of Protective Services	Ed Atkinson	*Primary:* provide data, information, and other relevant plan content; work to determine CWRP actions; conduct outreach with other stakeholders and the public to discuss the plan and receive additional input.	Implement Princeton's Community Wildfire Resiliency Plan. Provide outreach to and communicate with applicable stakeholders.
	Fire Chief	Rob Banks		
	Infrastructure Director	Jamie Umpleby		
BCWS Kamloops Fire Centre	Wildfire Prevention Officer - Fuels Management	Michael Aldred	*Advisory, support and approval, program development and monitoring:* review and approve funding program (CRI and WRR) applications. Additionally, for potential fuel management activities, provide the technical expertise (proposed treatment areas, prescription review, treatment implementation, and burn plan review).	Centre staff can provide FireSmart subject matter and prevention program and funding program expertise. Reviewing and approving funding program applications by the fire centre is a requirement of the current available funding streams (CRI and WRR).
	Prevention Specialist	Nicole Bonnett		
BCWS Merritt Fire Zone	Wildfire Technician; LFR	Jonas Joe	*Advisory and support:* provide local level fire response knowledge and history and answering operational questions. Assist in a support capacity by providing input and plan review and	Zone staff are considered the local wildfire experts. Zone staff do not approve plans or funding applications nor are they

[40] Current person operating in this role at the time this document was written.

Agency	Title	Person[40]	Role	Comments
			identifying WRR areas of concern.	available to manage CRI and WRR programs.

Local Stakeholders and Land Managers

Despite local land managers and stakeholders within the WUI declining requests to be part of Princeton's CFRC, many requested to be included in communications regarding wildfire, FireSmart, CRI, and WRR activities planned in and around areas they manage/have interests with. Table 22 details these entities, their contacts, and other additional information.[41]

Table 22: Local stakeholders and land managers within the WUI to be included in wildfire, FireSmart, CRI, and WRR activities and communications (as applicable)

Stakeholder or Land Manager	Contact Title	Contact Person	Comments
RDOS	FireSmart Coordinator	Dave Bodak	Responded to initial CWRP information gathering questionnaire. Requested to review and provide comment on this CWRP. Can assist and provide guidance to Princeton with FireSmart program applications, planning, and events.
RockRidge Canyon	VP Property Operations	Carolyn Mortensen	Responded to initial CWRP information gathering questionnaire. Requested to review and provide comment on this CWRP. Has an existing contract with Princeton FD for fire response.
Weyerhaeuser Company Limited	Stewardship Manager - Princeton Timberlands	Brian Drobe	Responded to initial CWRP information gathering questionnaire. Requested to review and provide comment on this CWRP. Princeton can contact Brian regarding recommendations and action items involving Weyerhaeuser.
Vermillion Forks Community Forest	Stewardship Manager - Princeton Timberlands	Brian Drobe	Responded to initial CWRP information gathering questionnaire. Requested to review and provide comment on this CWRP. Princeton can contact Brian regarding recommendations and action items involving the community forest.
Woodlot 0393	Woodlot license holder	Steven Curtis	No replies to emails/phone calls regarding this CWRP.
Woodlot 0350	Woodlot license holder	David Atkinson	No replies to emails/phone calls regarding this CWRP.
Woodlot 1446	Woodlot license holder	Neil Findlay	No replies to emails/phone calls regarding this CWRP.
Woodlot 1861	Woodlot license holder	Jaymie Atkinson	Responded to initial CWRP information gathering questionnaire. Did not request to review and provide comment on this CWRP.

[41] Copper Mountain Mining Corporation, operator of the mine approximately 20km south of Princeton, did not respond to inquiries regarding involvement in the preparation of this document.

Stakeholder or Land Manager	Contact Title	Contact Person	Comments
Fortis BC	Unknown	Unknown	No replies to emails/phone calls regarding this CWRP.
BC Hydro	Vegetation Management Coordinator	Ben Cave	Princeton can contact Ben regarding vegetation management projects adjacent to BC Hydro infrastructure.

Recommendation and action items Princeton can implement to continue growing interagency relationships and increase interagency cooperation are listed below in Table 23.

Table 23: Interagency cooperation recommendation and action items

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
Objective: broaden from department or agency siloes and a single jurisdiction-based approach to a risk driven, multi-agency and multi-scalable approach.							
25	High	Engage and work with surrounding forest licensees (Vermillion Forks Community Forest, Woodlots 0350, 1861, 1446, and 0393, Weyerhaeuser, etc.) to: 1) Consider developing a rationale for reduced stocking standards applicable to surrounding forest licensees by employing a qualified wildfire management professional, and in consultation with the Fuel Management Specialist (Kamloops Fire Centre) and MFLNRORD. This can be attained by adding fire management stocking standards to their respective forest stewardship plans / license plans / woodlot management plans and to consider applying them in portions of the wildland urban interface. 2) Ensure that high risk activities, such as vegetation management, pile burning, and harvesting do not occur during high/extreme fire danger times. Lobby for adequate fire suppression tools (as per wildfire act and regs) being on-site during high-risk activities.	1) Reduce interface wildfire risk throughout managed forest lands that are closest to structures in the WUI. Weyerhaeuser does not currently have any developed but is open to developing and applying fire management stocking standards where appropriate (they also manage the Vermillion Forks Community Forest). Some MFLNRORD Natural Resource Districts have already developed fire management stocking standards that could be applied. 2) Reduce chance of ignitions as per the *Wildfire Act* and reduce spread potential during an ignition event.	1) Princeton (FLNRORD, Stakeholders, Consultant) 2) Stakeholders	5 years	1) Interface wildfire stocking standard created, approved, and implemented 2) High-risk activities not conducted during high/extreme fire danger	1) UBCM CRI funding available (~$5,000 and ~60 hours in-house) 2) Cost of equipment paid by stakeholder
26	High	Continue to promote utility right-of-way best management practices (BMPs) for regular brushing and clearing of woody debris and shrubs by FortisBC and BC Hydro to help reduce fire risk, utility pole damage, and subsequent outages. In addition, FortisBC, BC Hydro, and the Ministry of Transportation and Infrastructure should ensure rights-of-way do not contain fine fuel accumulations (< 7.5 cm, easily cured) and significant regeneration of	Tree failures adjacent to power lines (transmission and distribution) are common occurrences and represent significant risks to ignition within the WUI. Encroachment of understory vegetation and overhanging trees were noted by consultants in various locations throughout the WUI.	Princeton (BC Hydro, FortisBC)	5 years	BMPs in use for the region	(~30 hours in-house)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
		conifer vegetation prior to and during the fire season and are maintained in a low hazard state.					
27	High	Lobby private Critical Infrastructure owner/operators to complete FireSmart Critical Infrastructure Assessments and plan mitigation works as a result of those assessments.	Creates opportunities for joint-applied/funded CRI and WRR activities. Princeton could offer the time of its own Local FireSmart Representatives to carry out the assessments.	Princeton	Within 3 years	All privately owned CI are assessed	Private (~$500 per structure)
28	High	Continue to participate in RDOS CFRC meetings.	Creates opportunities for joint-applied/funded CRI and WRR activities across jurisdictions.	Princeton	Ongoing	Continued participation	Princeton (no cost)
29	High	Plan Princeton CFRC scheduled meetings, especially prior to and during fire season.	Continued communication and planning across local stakeholders contribute to wildfire preparedness.	Princeton CFCR	Ongoing	Scheduled meetings	Princeton (no cost)
30	High	Continue to have relevant local government and Princeton FD members attend annual FireSmart BC conferences, hosted by the BC FireSmart Committee.	Participation will continue to foster a strong relationship between Princeton and FireSmart BC/Canada.	Princeton	Ongoing	1 local gov. and 1 FD member each year	UBCM CRI funding available ($ dependent on location and travel distances)

5.5 CROSS-TRAINING

All members of the Princeton FD receive weekly training focused on exterior attack structural firefighting and plans are in place to begin scheduled interior attack training. On a yearly basis BCWS trains the department for the S100 course as well as practical wildland firefighting tactics (Princeton FD also has three active members that can instruct the S-100 course as well as two active members that can instruct the Wildland Structural Protection course). BCWS operates a seasonal fire base in Princeton (Nicola Fire Base), and crews will join Princeton FD training exercises when available. Additionally, department members take courses on wildfire behaviour and fire weather to better understand potential fire behaviour. Within Princeton local government and Princeton FD, 12 persons have Incident Command System training, one person has FireSmart Home Partners Mitigation Specialist training, and two people are trained Local Firesmart Representatives (with four total in the upper Similkameen area).

Princeton should look to increase emergency simulation exercises (which create valuable cross-training opportunities) that involve municipal staff, Princeton FD, and BCWS. One example would be a joint wildfire simulation exercise and the opportunity to discuss working together on inter-agency fires. Additionally, true cross-training between BCWS and Princeton FD would include BCWS being trained on water supply from FD trucks. It must be noted that SPP-WFF1 (Wildland Firefighter Level 1 for structural firefighters) is a new S100 equivalent course for structure firefighters only, and as such BCWS has phased out instruction of S100 training for fire departments. In addition to upholding SPP-WFF1 certification, it is suggested that all fire crew members undertake the SPP 115 course to train structural firefighters in the deployment of SPUs. FireSmart specific training is an excellent way to promote and enhance FireSmart education and outreach amongst Princeton and the surrounding communities. Princeton should look to grow its number of FireSmart trained individuals within Princeton FD, local government, and community members.

Recommendation and action items Princeton can implement to create and continue to grow cross-training opportunities are listed below in Table 24.

Table 24: Cross-training recommendation and action items

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
Objective: support the development of comprehensive and effective wildfire risk reduction planning and activities, as well as a safe and effective response.							
31	High	Ensure all fire personnel attain/continue to maintain their SPP-WFF1 certification at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires (i.e., SPP-115). Princeton FD should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources/budgets allow.	Ensure all Princeton FD personnel are qualified to respond to wildfire emergencies and use wildfire suppression equipment. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the application of structural protection units (SPUs).	Princeton FD	Ongoing	FD members training is encompassing and continually updated	Princeton ($/time dependent on training done)
32	High	Princeton should facilitate FireSmart Home Partners Mitigation Specialist Training and additional Local FireSmart Representative (LFR) Training opportunities for applicable Princeton FD and government emergency management personnel.	Increase Princeton's capabilities to provide FireSmart programs and resources to the community.	Princeton (Princeton FD)	Ongoing	2 additional Mitigation Specialists 2 additional LFRs	UBCM CRI program funding available ($/time dependent on training done)
33	High	Princeton should leverage Local FireSmart Representatives (LFR) to: 1) conduct outreach into priority FireSmart Neighbourhoods to identify potential community champions, and 2) schedule and conduct FireSmart Community Champion Training.	Increase Princeton's FireSmart priority neighbourhoods' capabilities to assume FireSmart planning and mitigation activities themselves.	Local FireSmart Representative	1) 2 years 2) 2-4 years	Community champion identified for each high risk FireSmart neighbourhood (Table 17)	1) ($/ time dependent) 2) UBCM CRI funding available
34	High	Princeton FD (with support from BCWS) should reach out to RockRidge Canyon and other fire protection area communities and stakeholders to: 1) plan and conduct S-100 training, and 2) assess and provide recommendations towards increasing wildfire fighting capabilities.	Increase the wildfire emergency preparedness of Princeton FD's fire protection area communities and stakeholders and their ability to protect themselves from wildfire.	Princeton FD (BCWS)	2 years, then ongoing	Princeton FD FPA has persons trained in S-100 and some basic wildfire fighting equipment available	UBCM CRI funding available for wildfire courses

5.6 EMERGENCY PLANNING

This section provides a high-level overview of Princeton's preparedness for an interface wildfire emergency and the resources available to fight one. In emergency situations when multiple fires are burning in different areas of the Province, BCWS resource availability may be scarce. Deployment of provincial resources occurs as per the process detailed in the Provincial Coordination Plan for Wildland Urban Interface Fires.[42] Therefore, local government wildfire preparedness and resource availability are critical components of efficient wildfire prevention and planning – individuals and agencies need to be ready to act. Princeton has newly updated evacuation planning and management documents and existing fire response mutual aid agreements with surrounding fire departments.

Pre-Incident Planning

Princeton's evacuation planning and management documents were updated in June 2020 and contain four toolkits to be implemented in sequential order: Toolkit 1 – Evacuation Overview and Quick Refence Guides; Toolkit 2 – Evacuation Checklists and Initial Action Requirements; Toolkit 3 – Evacuation Zone Operational Tools; and Toolkit 4 – Operational Reference Toolkit. The town is mapped into evacuation zones with evacuation routes assigned to each neighbourhood. Wildfires are a unique emergency and thus require unique planning: pre-incident planning checklists should be used to develop pre-incident wildfire suppression plans and maps, and a wildfire response plan should be tested and practiced annually, pre-fire season. These plans and maps (some of which are wholly or partially developed as part of this document), developed in consultation with wildfire fighting professionals (*e.g.,* Merritt Fire Zone and Kamloops Fire Centre staff, wildfire and emergency planning consultants), should consider at a minimum:[43]

- **Command:** Authority, constraints, structural protection needs, management constraints, etc.
- **Operations:** Helicopter base locations, flight routes, restrictions, and water intakes, fire control line locations and natural barriers, crew/personnel safety zones and staging locations, fuel caches, etc.
- **Logistics:** Base camp locations, roads and trails, utilities (CI), communications (CI).
- **Planning:** Maps (neighbourhoods, vegetation and fuel, hazards, critical infrastructure, archaeology and environmentally sensitive areas, water sources, access/egress, etc.

Wildfire Preparedness Condition Level

As part of the pre-incident planning, Princeton should consider developing local daily action guidelines based on expected wildfire conditions. Table 25 below provides a template that can be tailored specifically to Princeton, outlining actions staff can take as fire danger levels change throughout the year (but mostly

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

[43] CRI FCSF 2021 CWRP supplemental instruction guide

through the fire season).[44] Year-round the fire danger signs posted throughout Princeton and Princeton FD's FPA should be updated to reflect the current fire danger.

Table 25: Example of a Wildfire Response Preparedness Condition Guide

FIRE DANGER LEVEL	ACTION GUIDELINES
LOW	• All Community staff on normal shifts.
MODERATE	• All Community staff on normal shifts • Information gathering and dissemination through Princeton'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.

[44] CRI FCSF 2021 CWRP supplemental instruction guide

Mutual Aid Partners

Princeton FD has in place mutual aid agreements with the RDOS and five municipal departments in the South Okanagan (the closest being the Tulameen and District Fire Department, the Hedley Volunteer Fire Department, and the Keremeos Volunteer Fire Department). Mutual aid is used on average twice a year.[45] Princeton FD also has a mutual aid agreement with BCWS. Princeton is within the Merritt Fire Zone and keeps direct contact with Zone staff, Kamloops Fire Centre staff, and the seasonal Nicola Fire Base staff located in Princeton. Princeton FD can and will respond to mutual aid callouts in the Okanagan area as well as to wildfires outside of its fire protection area.

Princeton FD will be contacted by local BCWS bases (Merritt or Nicola) to assist with events in the region as needed. These assistance callouts also create valuable training opportunities for Princeton FD – as was the case for a 2017 callout to a wildfire entering Princeton FD's fire protection area where department members teamed up with BCWS crews to help with structure protection, digging guards, setting up wet lines, and supplying water for portable cisterns. The release of Princeton FD personnel and equipment is dependent on retaining what is required to adequately keep the town protected.

Firefighting Resources

Table 26 summarizes the available firefighting resources to Princeton FD and its members. It is recommended that Princeton FD continues to work with BCWS to train with wildfire fighting equipment and regularly evaluate the need for more equipment and training. Currently, Princeton FD is well equipped to handle WUI wildfire response.

Table 26: Princeton FD firefighting resources

Fire Department	Number of Stations	Number of Members	Apparatus Type	Description / Comment
Princeton FD	1	1 x Fire Chief 22 x Volunteer Members	Wildland Fire Truck	300-gallon tank 250 gallon per minute pump
			Fire Engine	500-gallon tank 1250 gallon per minute pump
			Fire Engine	500-gallon tank 840 gallon per minute pump
			Fire Engine	1000-gallon tank 1050 gallon per minute pump
			Tender Truck	2500-gallon tank 840 gallon per minute pump
			Tender Truck	1700-gallon tank 250 gallon per minute pump
			Wildfire: Nomex Overalls	For every member
			Wildfire: Portable Pumps	10
			Wildfire: Portable Sprinklers	60
			Wildfire: 1-inch Hose	2000 feet

[45] Princeton FD Fire Chief via CWRP information gathering questionnaire

Fire Department	Number of Stations	Number of Members	Apparatus Type	Description / Comment
			Wildfire: 1 ½ -inch Hose	1500 feet
			Wildfire: Hand tools	Pulaski's, Mcleod's, Shovels, etc.

When analyzing the last decade of callouts for the Princeton FD, 2020 was recognized as a 'low' year. Princeton FD estimates from 2011-2020 wildland callouts remained relatively constant at five to 10 per year. Structural callouts over that same period fluctuated, with low years consisting of four to five callouts and high years consisting of at least 15. Over that same time, nuisance callouts have dropped, with no clear attributed cause.

Recommendations and action items are detailed below in Table 27.

Table 27: Emergency preparedness recommendation and action items

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
Objective: 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 provide improving Princeton's ability to respond to (during and after) a wildfire emergency.							
35	High	Princeton FD should continue engaging BCWS to conduct annual reviews ensuring PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use.	Maintain an annual structural and interface training and equipment review program and maintain a strong relationship between Princeton FD and BCWS.	Princeton FD (BCWS)	Yearly (pre-fire season)	Wildland firefighting equipment resources are complete	(no cost; ~10 hours in-house)
36	High	Conduct yearly (pre-fire season is best) response exercises with RockRidge Canyon and other Princeton FD fire protection area contract holders. Identify hazards, barriers to access (i.e., locked gates, tight or no turnarounds), and other response issues and develop measures to address them.	Maintain and grow knowledge of fire protection area communities and stakeholders and create a strong relationship between Princeton FD and them.	Princeton FD (BCWS, RockRidge Canyon)	Yearly (pre-fire season)	Response exercises conducted at least once every two years	Princeton (~12 hours in-house per exercise)
37	High	Complete and participate in regular testing of, and updates to, the Evacuation Plan for Princeton.	Identify any challenges with the Evacuation Plan before it is deployed in a real emergency.	Princeton (Princeton FD, Emergency Management Services)	Yearly	Testing conducted at least once every two years	Princeton (~12 hours in-house per test exercise)
38	Moderate	Develop an Evacuation Plan pamphlet that summarizes key components of the Evacuation Plan, specific to resident roles during an evacuation event. The pamphlet should be made available online and could be available as a hard copy at general stores.	Pamphlets are an effective public communication tool.	Princeton	2 years	Pamphlets created and available to the public	Princeton (~$5.00/ pamphlet; 10 hours in-house)
39	Moderate	Update Princeton's HRVA and emergency management plan with information and data from this CWRP. Develop wildfire specific incident plans and associated maps. Incorporate items listed in the Pre-Incident Planning subsection above. Local Fire Threat and stakeholders/tenure holders contact information should be incorporated within the map. The map should be included in the	Wildfire incident plans and maps will support emergency response in the event of a wildfire and/or evacuation event. These plans help target emergency planning and effort in meaningful and effective ways, such knowing where fire guards can/can't be built, as well as minimizing the need for using machinery to build cat guards in sensitive areas.	Princeton (Consultant, BCWS, RDOS)	5 years	Wildfire incident plans and associated maps created and made available	Princeton (~80 hours consultant and in-house hours)

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
		Princeton Evacuation Plan and shared with fire suppression personnel, BCWS, and industrial operators (Weyerhaeuser, Woodlots, Community Forest) to support emergency response in the event of a wildfire. The map should be reviewed as needed to incorporate additions and/or changes.					
40	High	Princeton's firehall, municipal hall, sewer stations, and water pumps/wells do not have backup gas- or diesel-powered generators. Princeton should invest in secondary power sources to continue these services in the case of prolonged or extensive power outage. Upgrade or realign resources, as prioritized.	Ensure that both the Princeton FD Fire Hall and all ESS facilities have back-up gas or diesel generators with sufficient fuel supply for extensive power outages (3 + days) so that they can function as reception centers/department operation centers as required in the event of an emergency	Princeton	5 years	All CI have back-up power sources	Princeton ($ dependent on requirements)
41	High	Princeton should apply for UBCM CRI funding to hire a FireSmart coordinator (full or part-time basis).	To manage the planning and implementation of recommendations and action items in this report. Explore 'sharing' a part-time position with one or more adjacent municipalities, creating one full time job.	Princeton	1 year	FireSmart coordinator hired	UBCM CRI funding available ($14,000 contract pay)
42	Moderate	Princeton should develop an outreach document that outlines emergency fuel/propane emergency shut off best-practices for facilities with hazardous infrastructure (e.g., gas stations, ice hockey arenas, mills) to enact in the event of an approaching wildfire or ember shower. Consider contacting the Emergency Management BC Regional Office for guidance.	Provide facilities with hazardous infrastructure with resources/procedures to reduce hazard during a wildfire event.	Princeton	5 years	Document created and made available to hazardous infrastructure owners and operators	UBCM CRI funding available (~40 hours in-house)

5.7 VEGETATION MANAGEMENT

The goal of vegetation management is to 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 structures and the community. Three main zones are discussed to appropriately scale and plan vegetation management activities across the WUI landscape (see Appendix A-2: Proximity of Fuel to the Community for expanded descriptions and information):

1) the Home and Critical Infrastructure Ignition Zone,
2) the Community Zone; and
3) the Landscape Zone.

It was noted during field visits that compliance to FireSmart vegetation management in Princeton's Home and Critical Infrastructure Ignition Zone was generally poor. Vegetation management within its Community and Landscape Zones has taken place (via operational fuel treatments), but this should be expanded upon to further reduce wildfire risk to the community as well as the potential for fire transmission between neighbourhoods.

Overall, Princeton should focus on a multi-barrier vegetation management approach through two different activities:

1. *Residential scale FireSmart landscaping*: 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 Noncombustible Zone and Priority Zones 1, 2 and 3.
    - Focused primarily in the Home and Critical Infrastructure Ignition Zone (Figure 3 below).

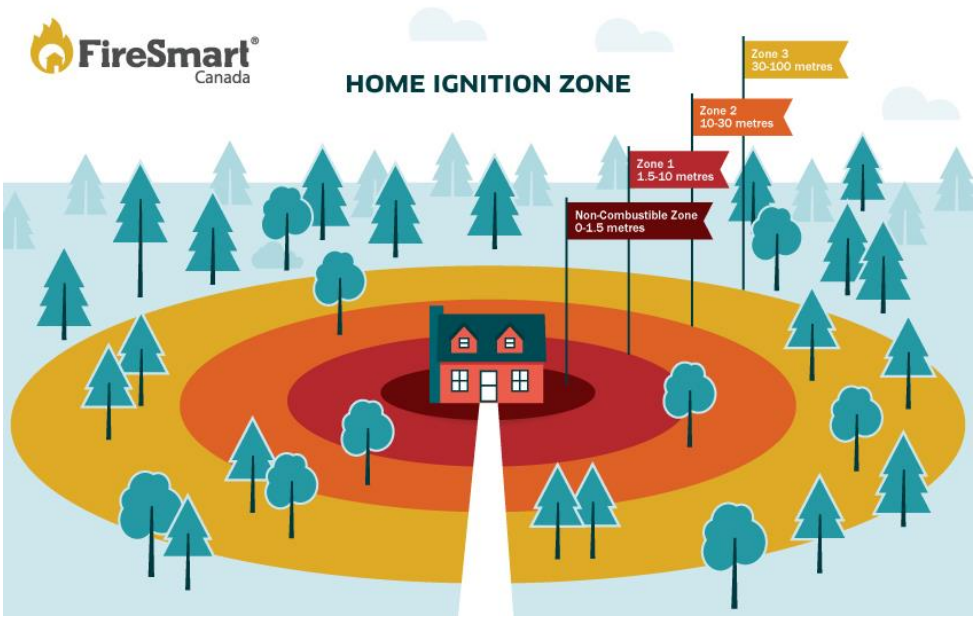
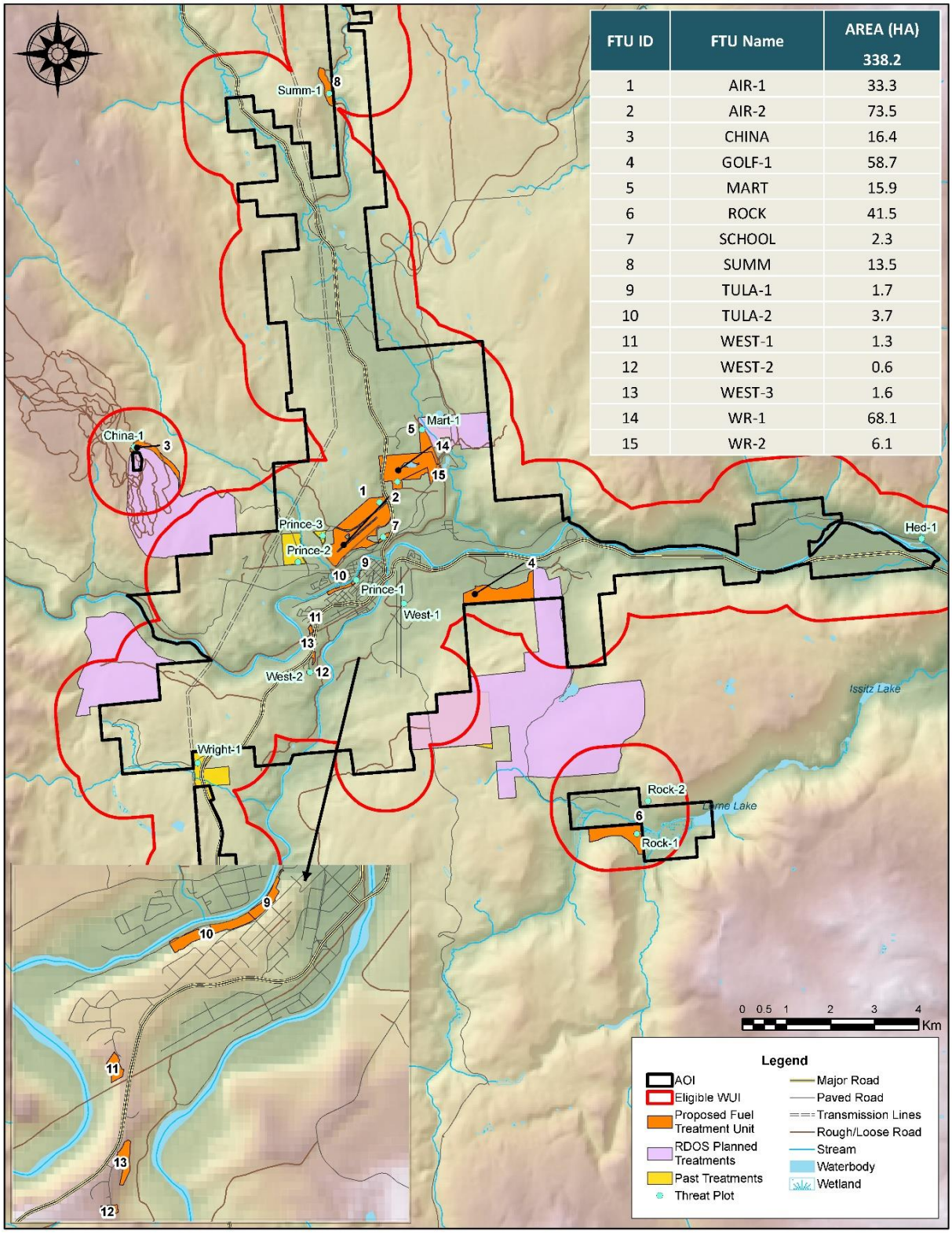


Figure 3: FireSmart home and critical infrastructure ignition zone

Princeton FD's Local FireSmart Representatives (LFRs) should assist neighbourhoods and homeowners in complying with FireSmart vegetation management principles at both the neighborhood and individual home-level. This could be implemented by planning a community/neighbourhood chipping program or bin disposal program with the help of neighbourhood champions, LFRs, and Neighbourhood FireSmart Committees.

2. *Fuel management treatments*: The manipulation or reduction of living or dead forest and grassland fuels to reduce the rate of spread and head fire intensity and to enhance the likelihood of successful suppression.
    - Focused in the Community Zone and Landscape Zone (Municipal and Crown Lands).

Multiple fuel treatments have been proposed in the WUI's Community and Landscape Zones, as described in Table 28 and shown on Map 8. Two past treatment units implemented as recommended by Princeton's 2006 CWPP are within the Community Zone and were assessed as part of this CWRP: West China Creek Road and Airport Road (both Crown provincial land inside Princeton's municipal boundary). Both treatment units still retain their efficacy but should be re-evaluated in 5-10 years. Three past treatment units implemented as recommended by Princeton's 2006 CWPP are within the Landscape Zone and were assessed as part of this CWRP: August Lake Road and Copper Mountain Road, Highway 3 West, and Martin's Lake. The August Lake Road and Copper Mountain Road treatment unit has retained its efficacy on the west side of Highway 3, but portions on the east side exhibit higher than desired retained stems per hectare. This unit is proposed in the RDOS 2020 CWPP as a fuel treatment unit, and as such Princeton should lobby for its assessment and prescription development. The Highway 3 West unit has retained its efficacy but should be reevaluated in 5-10 years. The Martin's Lake treatment unit has also retained its efficacy in terms of pruning and spacing, but prescribed burn on a recurring cycle is recommended. This treatment unit area is also proposed in the RDOS 2020 CWPP as a fuel treatment unit, and as such Princeton should lobby for its assessment and prescription development.



FTU ID	FTU Name	AREA (HA) 338.2
1	AIR-1	33.3
2	AIR-2	73.5
3	CHINA	16.4
4	GOLF-1	58.7
5	MART	15.9
6	ROCK	41.5
7	SCHOOL	2.3
8	SUMM	13.5
9	TULA-1	1.7
10	TULA-2	3.7
11	WEST-1	1.3
12	WEST-2	0.6
13	WEST-3	1.6
14	WR-1	68.1
15	WR-2	6.1

Map 8: Princeton CWRP Proposed Fuel Treatment Units

Table 28: Summary of Proposed Fuel Treatment Units

Map #	FTU Name	Total Area (ha)	Treatment Unit Location / Type	Priority	Wildfire Behavior Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme + High	Mod.	Low		
1	AIR-1	33.5	Community Zone Polygon treatment unit	MODERATE	0.0	33.3	0.0	Private land borders to the north (owned by a nature trust organization; there may be an opportunity to extent treatment onto the private land for ecological restoration purposes). The Thomas Community Watershed is within 100 m to the north. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This unit is on Princeton Municipal land on the north side of the airport and is accessed via Airport Road. Located on a gentle southeast facing slope, it is composed almost entirely of O-1a/b fuel type with a minor component of C-7. It is part of a larger O-1a/b area stretching both north (out of town) and south (into town). Treatment will reduce local fire threat by reducing available dry grass fuels in the WUI and help restore natural disturbance fire event cycles and ecological habitat. Located downwind of the airport, this unit would also provide protection from accidental ignition from airport activities and fuels.
2	AIR-2	73.5	Community Zone/HIZ Polygon treatment unit	HIGH	0.8	72.1	0.6	Private land with residences borders to the west and south. The airport is active and treatments will need to be coordinated with airport traffic/needs. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This unit is on Municipal land, surrounds the airport runway, borders residences to the east, and borders the Princeton Secondary School to the south. Accessed via Airport Road, it is composed entirely of 0-1a/b (grass), and thus is planned as a prescribed burn. It is part of a larger 0-1a/b area stretching north (out of town). Treatment will reduce local fire threat (and protection from accidental ignition from airport activities and fuels) by reducing available dry grass fuels in the WUI and help restore natural disturbance fire event cycles and ecological habitat. Note: the airport is entirely fenced in. This could provide an opportunity for fuel management by animals (such as goats) if scheduled properly with airport activities.
3	CHINA	16.4	Landscape Zone Linear treatment unit	MODERATE	11.7	4.7	0.0	Community Forest overlap. Ungulate winter range overlap. Old growth management area (non-legal) overlap. Recreation site and building south of the unit. Private land is adject to the southeast edge. Licensed water points of	This unit is on Crown Provincial land and parallels West China Creek Road (on its east side) which is used to access a cross-country ski club house and trails (RDOS proposed fuel treatments parallel the roads west side). It is composed entirely of hazardous C-3 fuel type featuring dense clumps of

Map #	FTU Name	Total Area (ha)	Treatment Unit Location / Type	Priority	Wildfire Behavior Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme + High	Mod.	Low		
								diversion occur within. Prior to treatment implementation, Vermillion Forks Comm. For. should be consulted so that impacts to values can be prevented or mitigated, and treatment is integrated with licensee planning. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	mature stems and scattered dead pine. Treat to reduce ladder fuels, horizontal continuity, and debris accumulation. Treatment will increase the efficacy of the planned RDOS FTU by protecting the West China Creek Road on both sides which acts as egress for the public in the area (and access for fire crews fighting a wildfire).
4	GOLF-1	58.7	Landscape Zone/ Community Zone Linear treatment unit	HIGH	1.5	43.0	14.2	Private property borders the south and west edges. The north edge borders a public golf course with a camper trailer camp site. The east edge borders with a proposed RDOS FTU. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This unit is on Crown Municipal land and is located on the south edge of the Princeton Golf Course. Access is via Darcy Mountain Road. Recommended as a FTU by the BCWS Merritt Fire Zone during meetings, it is comprised of both C-7 and 0-1a/b fuel types. Treatment should focus on a combination of reducing surface and ladder fuels in the treed thickets and prescribed burning. This unit borders a proposed RDOS FTU to the east and would act as a downwind fuel break from a fire moving north and northwest towards Princeton with the prevailing fire season winds, or an anchor opportunity for backburning into an active fire to the south. Treatment will also help restore natural disturbance fire event cycles and ecological habitat. Hazardous fuels at local wood mills and pellet plants are less than 2km to the northeast, well within reach of firebrands.
5	MART	15.9	Landscape Zone Polygon treatment unit	MODERATE	0.0	15.9	0.0	Private property borders the west edge and southeast edge. Old growth management area (non-legal) overlap. Proposed RDOS FTU borders the east edge. The Martin Lake recreation site is 200 m northeast. Archeological assessments may be required as	This unit is located on Crown Provincial land, on a slope below houses proposed in a new development, and above the Martin Lake rec site (and borders the west edge of a proposed RDOS FTU). Accessed via McNamara Road, it is composed almost entirely of 0-1a/b fuel type, with a minor component of C-7 fuel type. Treatment would

Map #	FTU Name	Total Area (ha)	Treatment Unit Location / Type	Priority	Wildfire Behavior Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme + High	Mod.	Low		
								identified through First Nation consultation during the prescription development.	expand the efficacy of the planned RDOS treatment area, reduce the fire risk to the proposed new development, and protect against fire escapes and accidental ignitions from the public in the rec. site. Treatment will also help restore natural disturbance fire event cycles and ecological habitat. Treatment should focus on a combination of reducing ladder fuels in treed thickets and prescribed burning.
6	ROCK	41.5	Landscape Zone Polygon treatment unit	HIGH	19.5	20.8	0.7	The north edge borders Crown Provincial land lease. Old growth management area (non-legal) overlap. Ungulate winter range overlap. Riparian considerations for wetlands and lakes north and east. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This unit is located on Crown Provincial land southwest of the RockRidge Canyon and is accessed via Willies Ranch Road. The camp sees upwards of 500 persons a day during the peak summer season (coinciding with the fire season) and has only one access/egress road. The unit is comprised almost entirely of C-7 fuel type. The forest stand is vertically stratified (uneven aged) creating integrated horizontal and ladder fuels, and high fuel loading. Treatment should focus on reducing all three and would create a fuel break for Rockridge and the east end of the access/egress road from a fire moving north and northwest with the prevailing fire season winds. This treatment unit could also provide an anchor opportunity for backburning into an active fire to the south.
7	SCHOOL	2.3	Community Zone/CIIZ Polygon treatment unit	HIGH	0.0	2.3	0.0	Adjacent to both the Princeton Secondary School and Princeton District Arena – both CI as listed emergency shelters. High use public trail through the FTU. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	Located on Princeton Municipal land between the Princeton Secondary School (Old Merritt Hwy) and Princeton District Arena (Old Hedley Road), this treatment unit is steep sloped and comprised almost entirely of C-7 fuel type. A walking trail to/from the school travels through, increasing the potential for accidental ignitions. Treatment should focus on a combination of reducing ladder fuels and prescribed burning. Treatment would reduce the fire risk adjacent to CI as well as provide

Map #	FTU Name	Total Area (ha)	Treatment Unit Location / Type	Priority	Wildfire Behavior Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme + High	Mod.	Low		
									a good education opportunity for students and the public (interpretive signage could be installed at each end of the trail). Treatment will also help restore natural disturbance fire event cycles and ecological habitat. High public use of the trail increases accidental ignition risk.
8	SUMM	13.5	Landscape Zone Linear treatment unit	MODERATE	12.4	0.0	1.1	Woodlot 1061 overlap. Ungulate winter range overlap. Private property borders the south edge. Riparian considerations for Summers Creek. Prior to prescription development and treatment implementation, W1061 should be consulted so that impacts to values can be prevented or mitigated, and treatment is integrated with licensee planning. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This unit is located on Crown Provincial land paralleling (on the west) a portion of Summers Creek Road. Rural residences occupy most of the narrow valley, which had large portions burned during a 2017 wildfire. The unit is comprised almost entirely of C-7 fuel type. The forest stand is open, but with low ladder fuels and moderate fuel loading. Treatment should focus on reducing ladder and ground fuels and would create a fuel break along Summers Creek Road, the only access/egress route for residents
9	TULA-1	1.7	Community Zone/HIZ Linear treatment unit	HIGH	1.7	0.0	0.0	Slope stability concerns – an assessment by a qualified professional should be done in conjunction with prescription development. Private property borders the south and east edges. Riparian management considerations for the Tulameen River. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This treatment unit is located on Princeton Municipal land on a steep slope above Harold Avenue between dense housing and the Tulameen River. Comprised entirely of hazardous C-3 fuel type, the stand is characterized by dense conifers with low crowns and high fuel loading. Treatment should focus on reducing horizontal and vertical fuel continuity and reducing ground fuels. Treatment would lower fire risk to and protect adjacent residences.
10	TULA-2	3.7	Community Zone/HIZ	HIGH	3.6	0.1	0.0	Slope stability concerns – an assessment by a qualified professional should be done in conjunction with prescription development. Private property borders the south and west edges. Riparian	This treatment unit is a continuation of the TULA-1 FTU heading west but is located on Crown Provincial land within Princeton's municipal boundary. Fuel type, stand attributes, and treatment type and rationale from TULA-1 are the

Map #	FTU Name	Total Area (ha)	Treatment Unit Location / Type	Priority	Wildfire Behavior Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme + High	Mod.	Low		
			Linear treatment unit					management considerations for the Tulameen River. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	same. TULA-1 and TULA-2 should be treated in conjunction with one another to increase efficacy.
11	WEST-1	1.3	Community Zone/HIZ/CIIZ Polygon treatment unit	HIGH	1.1	0.2	0.0	Slope stability concerns – an assessment by a qualified professional should be done in conjunction with prescription development. Private property borders the north and east edges. Riparian management considerations for the Tulameen River. Treatment operation considerations adjacent to critical infrastructure. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This treatment unit is located on Princeton Municipal land on a steep slope between the Tulameen River and the Ridgewood neighbourhood structures (CI and houses) at the south end of The Ridgeway. It is composed entirely of C-7 fuel type characterized by sparse mature conifers with low crowns, scattered immature conifers, and grass understory. Treatment should reduce ladder fuels (prescribed burning is recommended but may not be possible due to proximity to properties and houses). Treatment will reduce the fire risk to single access neighbourhood and CI. Treatment would also demonstrate FireSmart actions residents can take on their own properties.
12	WEST-2	0.6	Community Zone/HIZ/CIIZ Polygon treatment unit	MODERATE	0.0	0.6	0.0	Private property borders all edges. Treatment operation considerations adjacent to critical infrastructure. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This treatment unit is located on Princeton Municipal land at the south end of Westridge Drive on the south edge of structures (CI and houses) in the isolated West Ridge neighbourhood. It is composed entirely of C-7 fuel type characterized by mature conifers in clumps with low crowns, scattered immature conifers, and grass understory. Treatment should reduce ladder fuels and horizontal continuity in the treed clumps (prescribed burning is recommended but may not be possible due to proximity to properties and houses). Treatment will reduce the fire risk to houses and CI. Treatment would also demonstrate

Map #	FTU Name	Total Area (ha)	Treatment Unit Location / Type	Priority	Wildfire Behavior Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme + High	Mod.	Low		
									FireSmart actions residents can take on their own properties.
13	WEST-3	1.6	Community Zone/HIZ Linear treatment unit	HIGH	0.0	1.4	0.2	Slope stability concerns – an assessment by a qualified professional should be done in conjunction with prescription development. Private property borders almost all edges. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This treatment unit is located on Princeton Municipal land on the east edge of residences in the isolated West Ridge neighbourhood between Westridge Drive and Stevenson Creek Road. It is composed entirely of C-7 fuel type characterized by mature conifers in clumps with low crowns, scattered immature conifers, and grass understory. Treatment should reduce ladder fuels and horizontal continuity in the treed clumps (prescribed burning is recommended but may not be possible due to proximity to properties and houses). Treatment will reduce the fire risk to houses and provide a fuel break from a wildfire travelling northeast with the dominant fire season winds. Treatment would also demonstrate FireSmart actions residents can take on their own properties. Treatment in conjunction with FTU WEST-2 would further reduce wildfire risk to the neighbourhood.
14	WR-1	68.1	Community Zone Polygon treatment unit	MODERATE	0.0	65.5	2.2	Overlap with the Swan Lake Sanctuary – a wildlife reserve area. Private property borders parts of the north, southwest, and northeast portions of the FTU. Riparian considerations for Swan Lake and the surrounding wetland. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	This treatment unit is located on Crown Provincial land within the Princeton municipal boundary on the north edge of town between Highway 5A and Princeton Summerland Road. Composed of a mosaic of C-7 and O-1a/b fuel types, treed clumps of ponderosa pine and Douglas-fir have low live crowns. Treatment should focus on removing understory stems, reducing ladder fuels, and prescribed burn. Treatment will help restore natural disturbance fire event cycles and ecological habitat and support proposed RDOS FTUs adjacent to the east.
15	WR-2	6.1	Community Zone	MODERATE	0.0	5.5	0.6	Overlap with the Swan Lake Sanctuary – a wildlife reserve area. Private property	This treatment unit is a southern continuation of FTU WR-1 but is located on Princeton Municipal

Map #	FTU Name	Total Area (ha)	Treatment Unit Location / Type	Priority	Wildfire Behavior Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme + High	Mod.	Low		
			Polygon treatment unit					borders parts of the southwest and northeast portions of the FTU. Archeological assessments may be required as identified through First Nation consultation during the prescription development.	land bordering the north edge of the rodeo grounds. Fuel types, treatment types, and treatment rationale are the same as WR-1.

Recommendations and action items increase FireSmart vegetation management and practices within the WUI and associated Home and Critical Infrastructure Ignition Zones, Community Zones, and Landscape Zones are provided below in Table 29.

Table 29: Vegetation management action items

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
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.							
43	High	Proceed with detailed assessment, prescription development and treatment of fuel treatment units identified and prioritized in this CWRP.	To reduce wildfire hazard in priority treatment units.	Princeton (Consultant)	3 years	Prescriptions for high priority units developed, prioritizing HIZ/CIIZ and Community Zone FTUs	UBCM CRI funding available (~$500/ha prescription; ~$7500/ha treatment)
44	High	As part of fuel treatment implementation on Princeton municipal land (high public use areas such as next to neighbourhoods and the high school), Princeton should develop interpretive signage to demonstrate pre- and post-fuel treatment forest stands/grassland conditions.	Increase public awareness and support of fuel management practices.	Princeton	5 years	Signs placed in one high-public use area, post-treatment	UBCM program funding available
45	High	When operational fuel treatments are conducted, treatment monitoring 5-10 years out should be completed by a qualified professional. This can be completed with a CWRP update or as a stand-alone exercise.	Assess the efficacy of the treatment and to schedule maintenance activities. It is cheaper to perform maintenance early when regeneration is small. Note: past fuel treatments on areas recommended in Princeton's 2006 CWPP were assessed as part of this CWRP development.	Princeton (Consultant)	Ongoing	All completed fuel treatments are reassessed 5-10 years, and ongoing, post-treatment	UBCM CRI funding available (~100/ha for assessment)
46	High	Lobby RDOS for prescription development and implementation of FTUs that overlap past Princeton treatments at "Martin's Lake" and "Highway 3".	To reduce wildfire hazard in the Landscape Zone. Martin's Lake prescription development and treatments	Princeton/RDOS (Consultant)	5 years	Prescriptions developed for high priority units	UBCM CRI funding available

Item #	Priority	Recommendation / Next Steps	Comments	Lead (Involved)	Timeframe	Metric for Success	Funding Source / Est. Cost ($) or Person Hours
			by the RDOS should be completed in conjunction with proposed FTU MART.			within the Landscape Zone	(~$500 per hectare)
47	High	Princeton FD's Local FireSmart Representatives (LFRs) should assist neighbourhoods and homeowners in complying with FireSmart vegetation management principles at both the neighborhood and individual home-level.	Increase wildfire resiliency throughout priority neighbourhoods identified in this CWRP by collectively FireSmarting homes.	Local FireSmart Representative	5-10 years, and then ongoing.	FireSmart landscaping adopted in high priority FireSmart neighbourhoods (Table 17).	(Time and cost dependent on level of effort)
48	High	Plan and implement a community/neighbourhood chipping program or bin disposal program with the help of neighbourhood champions, LFRs, and Neighbourhood FireSmart Committees, if possible. Consider offering chipping/bin services as an incentive for neighbourhoods to join the FireSmart Neighbourhood Recognition Program. Education of FireSmart yard and landscaping principles, including chipping specifications should be incorporated into the program.	Aid homeowners in removing hazardous debris from properties, while educating residents on FireSmart yard and landscaping principles.	Princeton (Local FireSmart Representative, Community Champion)	3 years, and then yearly	Chipping/Bin program active and conducted yearly for high priority FireSmart neighbourhoods (Table 17).	UBCM CRI funding available (Example cost is $7,400: chipping contractor costs (four 8-hour days @ ~$200 per hour); $1000 for outreach)

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: Fire Risk Threat Assessment 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: Proximity of Fuel to the Community).
3. Analysis of predominant summer fire spread patterns using wind speed and wind direction during the peak burning period using ISI Rose(s) from BCWS weather station(s) (Appendix A-3: 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. Consider other local factors (i.e., previous mitigation efforts, and local knowledge regarding hazardous or vulnerable areas)
7. Identify priority wildfire risk areas for field assessment.

The basis for the prioritization of field assessment locations is further detailed in Appendix H: Fire Risk Threat Assessment Methodology. Wildfire Risk Assessment plot worksheets are provided in Appendix C: Wildfire Risk Assessment – Worksheets and Photos (under separate cover), plot locations are summarized in Appendix F: WUI Threat Plot Locations, and the field data collection and spatial analysis methodology is detailed in Appendix H: Fire Risk Threat Assessment Methodology.

6.1.1 APPENDIX A-1: FIRE RISK THREAT ASSESSMENT 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.[46] 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.[47] It should be noted that there are significant limitations with the fuel typing system which should be recognized. Major limitations include: a fuel typing system designed to describe fuels which sometimes do not occur within the AOI, fuel types which cannot

[46] Forestry Canada Fire Danger Group. 1992. Development and Structure of the Canadian Forest Fire Behavior Prediction System: Information Report ST-X-3.
[47] 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.

accurately capture the natural variability within a polygon, and limitations in the data used to create initial fuel types.[47] Details regarding fuel typing methodology and limitations are found in Appendix G: Fuel Typing Methodology and Limitations. There are several implications of the aforementioned limitations, which include: fuel typing further from the developed areas of the study has a lower confidence, generally; and, 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.

Table 30 summarizes the fuel types by general fire behaviour (crown fire and spotting potential). In general, the fuel type that may be considered hazardous in terms of fire behaviour and spotting potential in the WUI are C-3 and C-7, particularly if there are large amounts of woody fuel accumulations or denser understory ingrowth. C-5 fuel types have a moderate potential for active crown fire when wind-driven.[47] An M-1/2 fuel type can sometimes be considered hazardous, depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory, as well as those in the understory. An O-1b fuel type often can support a rapidly spreading grass or surface fire capable of damage or destruction of property, and jeopardizing human life, although it is recognized as a highly variable fuel type dependent upon level of curing. These fuel types were used to guide the threat assessment.

Forested ecosystems are dynamic and change over time: fuels accumulate, stands fill in with regeneration, and forest health outbreaks occur. Regular monitoring of fuel types and wildfire risk assessment should occur every 5 – 10 years to determine the need for threat assessment updates and the timing for their implementation.

Table 30. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the WUI are provided (as such, other fuel types, i.e., C-1, C-2, C-4, 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-7	Ponderosa pine and Douglas-fir	Low-density, uneven-aged forest, crowns separated from the ground, understory of discontinuous grasses and shrubs. Exposed bed rock and low surface fuel loading.	Surface fire spread, torching of individual trees, rarely crowning (usually limited to slopes > 30%), moderate to high intensity and rate of spread	Moderate
O-1a/b	Grass	Matted and standing grass communities; sparse or scattered shrubs, trees and down woody debris. Seasonal wetlands that have the potential to cure.	Rapidly spreading, high-intensity surface fire when cured	Low
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels; 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
S-1	Slash (jack / lodgepole pine, white spruce)	Any conifer slash	Moderate to high rate of spread and high to very high intensity surface fire	Low
W	N/A	Water	N/A	N/A
N	N/A	Non-fuel: irrigated agricultural fields, golf courses, alpine areas void or nearly void of vegetation, urban or developed areas void or nearly void of forested vegetation	N/A	N/A

**C-3 fuel type is considered to have a high crown fire and spotting potential within the 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.*

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

- C-3 fuel types being incorrectly identified by the PSTA as C-7, and
- C-7 fuel types being incorrectly identified by the PSTA as O1 a/b.

All fuel type updates were approved by BCWS, using stand and fuel descriptions and photo documentation for the review process (see Appendix B: Wildfire Risk Assessment – FBP Fuel Type Change Rationale for submitted fuel type change rationales). The resulting updated fuel types were shown earlier on Map 4.

6.1.2 APPENDIX A-2: PROXIMITY OF FUEL TO THE COMMUNITY

Home and Critical Infrastructure Ignition Zones

Multiple studies have shown that the principal factors regarding home and structure loss to wildfire are the structure's characteristics and immediate surroundings. The area that determines the ignition potential of a structure to wildfire is referred to as (for residences) the Home Ignition Zone (HIZ) or (for critical infrastructure) the Critical Infrastructure Ignition Zone (CIIZ).[48,49] Both the HIZ and CIIZ include the structure itself and four concentric, progressively wider Priority Zones out to 100 m from the structure (Figure 4 below). More details on priority zones can be found in the FireSmart Manual.[50]

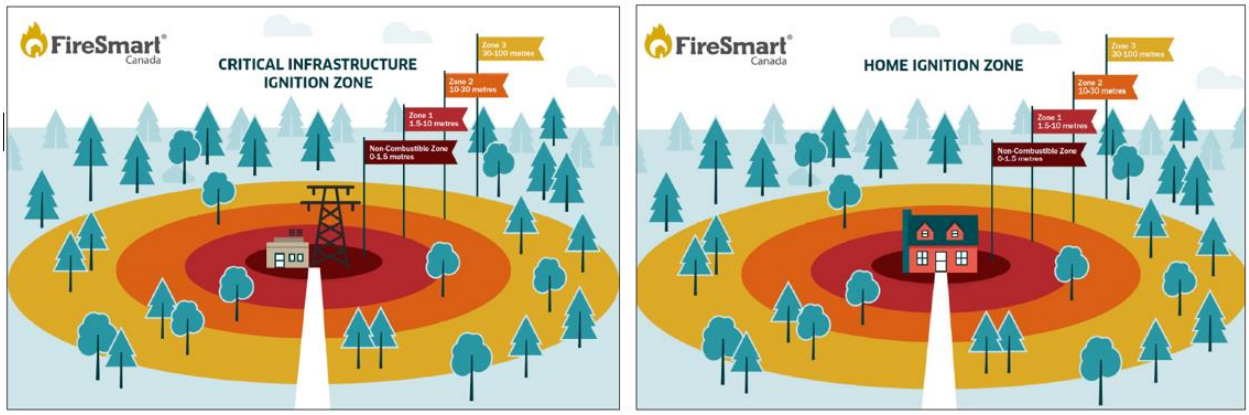


Figure 4: FireSmart Home and Critical Infrastructure Ignition Zone (HIZ, CIIZ)

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

Because ignitability of the HIZ/CIIZ is the main factor driving structure loss, the intensity and rate of spread of wildland fires beyond the community has not been found to necessarily correspond to loss potential. For example, FireSmart homes with low ignitability may survive high-intensity fires, whereas highly ignitable homes may be destroyed during lower intensity surface fire events.[49] Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do not

[48] Reinhardt, E., R. Keane, D. Calkin, J. Cohen. 2008. Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States. Forest Ecology and Management 256:1997 - 2006.
[49] Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. Journal of Forestry. p 15 - 21.
[50] https://firesmartcanada.ca/ and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart

necessarily result in WUI fire disasters.[51] 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

Vegetation management in the Community Zone encompasses all non-provincial Crown publicly owned lands that are within Princeton's municipal boundary and are typically beyond 30 metres from private structures (in some cases, this may also include small isolated provincial Crown land parcels within administrative boundaries)[52]. 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[52]. Depending on the results of FireSmart Structure Ignition Zone assessments on individual structures, vegetation management may be required out beyond 30 metres and up to 100 metres (FireSmart Priority Zone 3) on larger private parcels[52]. Municipal parks, municipal trails, municipal outdoor event spaces and fields, etc. are all part of the Community Zone. Many Community Zone open spaces/lands are often associated with high use by the public thus increasing accidental ignition potential and the wildfire risk to properties and homes surrounding them.

Landscape Zone

The Landscape Zone encompasses provincial Crown lands that are located outside Princeton's 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[52]. 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.[52]

Fire hazard classification in the WUI is partly dictated by the proximity of the fuel to developed areas within a community. More specifically, fuels closest to the community are considered to pose a higher hazard in comparison to fuels that are located at greater distances from values at risk. As a result, it is recommended that the implementation of fuel treatments prioritizes fuels closest to structures and / or developed areas, in order to reduce hazard level adjacent to the community. Continuity of fuel treatment is an important consideration, which can be ensured by reducing fuels from the edge of the community outward. Special consideration must be allocated to treatment locations to ensure continuity, as discontinuous fuel treatments in the WUI can allow wildfire to intensify, resulting in a heightened risk to values. In order to classify fuel threat levels and prioritize fuel treatments, fuels immediately adjacent to

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

[52] CRI FCSF 2021 Supplemental Instruction Guide

the community are rated higher than those located further from developed areas. Table 31 describes the classes associated with proximity of fuels to the interface.

Table 31. 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.*

6.1.3 APPENDIX A-3: 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 5 below displays the daily average ISI values for August Lake, which represents wind speeds and directions in the southeast of the WUI. During the fire season (April – October) predominant winds originate from the southeast, becoming more dominant in August and September.

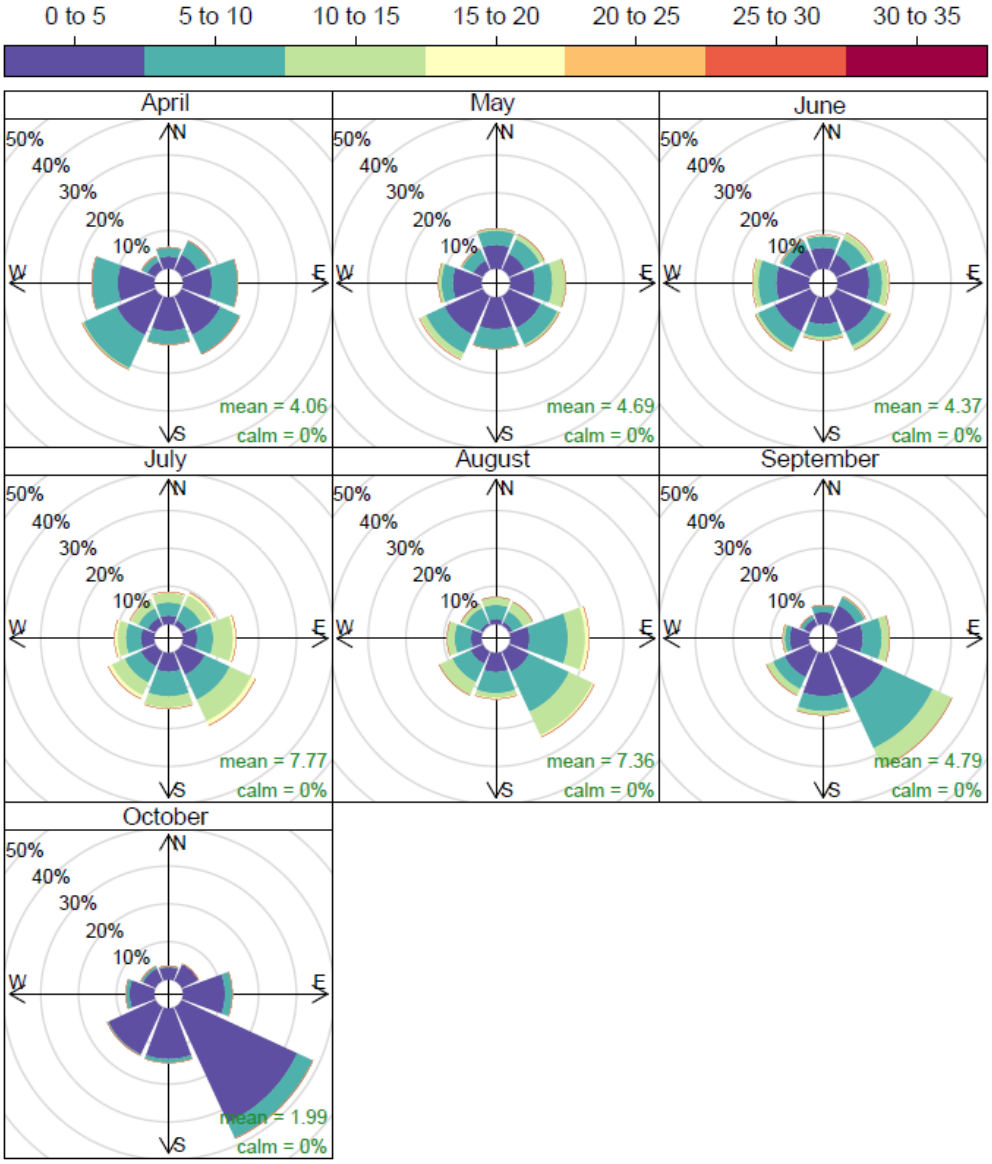


Figure 5: Initial Spread Index (ISI) roses depicting average daily wind speed and direction for each month during the fire season (April – October). Data taken from the August Lake fire weather station 2003 – 2015

6.2 APPENDIX B: WILDFIRE RISK ASSESSMENT – FBP FUEL TYPE CHANGE RATIONALE

Provided separately as PDF package.

6.3 APPENDIX C: WILDFIRE RISK ASSESSMENT – WORKSHEETS AND PHOTOS

Provided separately as PDF package.

6.4 APPENDIX D: MAPS

Provided separately as PDF package.

6.5 APPENDIX F: WUI THREAT PLOT LOCATIONS

Table 32 displays a summary of all WUI threat plots completed during CWRP field work. The original WUI threat plot forms and photos will be submitted as a separate document. The following ratings are applied to applicable point ranges:

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

Table 32. Summary of WUI Threat Assessment Worksheets.

WUI Plot ID	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
CHINA-1	RDOS - North side of China Creek Trails parking and cabin. In community forest.	Moderate	n/a
HED-1	RDOS - Westernmost FPA community. Forest strip at toe of talus/rock slope.	High	Moderate
MART-1	Princeton - between rodeo grounds and lakeside camp/rec area.	Moderate	n/a
PRIN-1	Princeton - middle of town, along rd to public works yard.	High	Extreme
PRIN-2	Princeton - previously treated area. New subdivision planned	Moderate	n/a
PRIN-3	Princeton - previously treated area with houses on E,S,W sides.	Moderate	n/a
PRIN-4	Princeton - grass slope between arena and high school.	Moderate	n/a
PRIN-5	Princeton - grass slope above airport.	Moderate	n/a
ROCK-1	RDOS - Rockridge canyon camp, south side.	High	Moderate
ROCK-2	RDOS - Rockridge canyon camp, nouth side.	High	Moderate
SUMM-1	RDOS - Summers Creek FSR (northern extent FPA)	High	High
WEST-1	Princeton - upper bench residential community, south end of town, west side of Hwy.	High	High
WEST-2	Princeton - upper bench residential community, south end of town, east side of Hwy.	Moderate	n/a
WR-1	Princeton - local wildlife reserve area.	Moderate	n/a
WRIGHT1	RDOS - previously treated area along Hwy, far south of town.	Moderate	n/a

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

6.6 APPENDIX G: FUEL TYPING METHODOLOGY AND LIMITATIONS

The initial starting point for fuel typing for the WUI was the 2019 provincial fuel typing layer provided by BCWS as part of the *2018 Provincial Strategic Threat Analysis* (PSTA) data package. This fuel type layer is based on the FBP fuel typing system. PSTA data is limited by the accuracy and availability of information within the Vegetation Resource Inventory (VRI) provincial data; confidence in provincial fuel type data is very low on private land. The PSTA threat class for all private land within the WUI was not available. Fuel types within the WUI have been updated using orthoimagery of the area with representative fuel type calls confirmed by field fuel type verification. Polygons not field-verified were assigned fuel types based upon similarities visible in orthophotography to areas that were field verified. Where polygons were available from the provincial fuel typing layer, they were utilized and updated as necessary for recent harvesting, development, etc.

It should be noted that fuel typing is intended to represent a fire behaviour pattern; a locally observed fuel type may have no exact analog within the FBP system. The FBP system was almost entirely developed for boreal and sub-boreal forest types, which do not occur within the WUI. As a result, the local fuel typing is a best approximation of the Canadian Forest Fire Danger Rating System (CFFDRS) classification, based on the fire behaviour potential of the fuel type during periods of high and extreme fire danger within the local MFLNRORD region. Additionally, provincial fuel typing depends heavily on VRI data, which is gathered and maintained in order to inform timber management objectives, not fire behaviour prediction. For this reason, VRI data often does not include important attributes which impact fuel type and hazard, but which are not integral to timber management objectives. Examples include: surface fuels and understory vegetation.

In some cases, fuel type polygons may not adequately describe the variation in the fuels present within a given polygon due to errors within the PSTA and VRI data, necessitating adjustments required to the PSTA data. In some areas, aerial imagery is not of sufficiently high resolution to make a fuel type call. Where fuel types could not be updated from imagery with a high level of confidence, the original PSTA fuel type polygon and call were retained.

For information on the provincial fuel typing process used for PSTA data as well as aiding in fuel type updates made in this document, please refer to Perrakis, Eade, and Hicks, 2018.[53]

[53] 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

6.7 APPENDIX H: FIRE RISK THREAT ASSESSMENT METHODOLOGY

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 (1436m 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

As part of the program, proponents completing a CWRP are provided with a supplementary PSTA dataset from BC Wildfire Services. This dataset includes:

- Fuel Type
- Structures
- Structure Density
- Eligible WUI (2Km buffer of structure density classes >6).

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

- AOI
- Proposed Treatment
- WUI (1Km buffer of structure density classes >6)

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. For the scope of this project, completion of WUI Threat Assessment plots on the entire AOI is not possible, and therefore an analytical model has been built to assume Fire Threat based on spatially explicit variables that correspond to the WUI Threat Assessment worksheet.

Field Data Collection

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

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

1. Update fuel-typing using orthophotography provided by the client and field verification.
2. Update structural data using critical infrastructure information provided by the client, field visits to confirm structure additions or deletions, and orthophotography
3. Complete field work to ground-truth fuel typing and threat ratings (completed 15 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 366 field stops with qualitative notes, fuel type verification, and/or photographs)
4. Threat assessment analysis using field data collected and rating results of WUI threat plots – see next section.

Spatial Analysis

Not all attributes on the WUI Threat Assessment form can be determined using a GIS analysis on a landscape/polygon level. To emulate as closely as possible the threat categorization that would be determined using the Threat Assessment form, the variables in Table 33 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 33. 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	
Large Woody Debris Continuity	No	
Live and Dead Coniferous Crown Closure	No	
Live and Dead Conifer Crown Base height	No	
Live and Dead suppressed and Understory Conifers	No	

WUI Threat Sheet Attribute	Used in Analysis?	Comment
Forest health	No	
Continuous forest/slash cover within 2 km	No	
WEATHER SUBCOMPONENT		
BEC zone	Yes	
Historical weather fire occurrence	Yes	
TOPOGRAPHY SUBCOMPONENT		
Aspect	Yes	
Slope	Yes	Elevation model was used to determine slope.
Terrain	No	
Landscape/ topographic limitations to wildfire spread	No	
STRUCTURAL SUBCOMPONENT		
Position of structure/ community on slope	No	
Type of development	No	
Position of assessment area relative to values	Yes	Distance to structure is used in analysis; position on slope relative to values at risk is too difficult to analyze spatially.

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

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

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 WUI Threat Score is greatly simplified, as determining the position of structures on a slope, the type of development and the relative position are difficult in an automated GIS process. This method uses the best available information to produce the initial threat assessment across the AOI in a format which is required by the UBCM CRI program.

The threat class ratings are based initially upon (geographic information systems) GIS analysis that best represents the WUI wildfire risk assessment worksheet and are updated with ground-truthing WUI threat

plots. WUI threat plots were completed in a variety of fuel types, slopes, and aspects in order to be able to confidently refine the GIS analysis. It should be noted that there are subcomponents in the worksheet which are not able to be analyzed using spatial analysis; these are factors that do not exist in the GIS environment.

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

6.8 APPENDIX I: LIST OF FIRST NATIONS AND ASSOCIATED GOVERNMENTS CONSULTED

Organization/Government	Contact Title	Email(s)	Phone #	Location
Upper Similkameen IB	Chief and Council	referrals@usib.ca	2502928733	Hedley
Nooaitch IB	Chief and Council	reception@nooaitchband.ca	2503786141	Merritt
Esh-kn-am Cultural Resource Management	Esh-kn-am Cultural Resource Management	paulmitchellbanks@gmail.com	2504582224	Merritt
Boston Bar First Nation	Chief and Council	tray69770@msn.com	6048678844	Boston Bar
Ashcroft Indian Band	Chief Greg Blain	gblain43715@yahoo.ca	2504539154	Ashcroft
Spuzzum First Nation	Chief and Council	info@spuzzumnation.com chief@spuzzumnation.com receptionist@spuzzumnation.com sdmb@spuzzumnation.com	6048632395	Yale
Lytton First Nation	Chief and Council	nntc.referrals@nntc.ca	2504552304	Lytton
Nlaka'pamux Nation Tribal Council	Chief and Council	nntc.referrals@nntc.ca	2504552711	Lytton
Boothroyd Indian Band	Chief and Council	nntc.referrals@nntc.ca	6048679211	Boston Bar
Oregon Jack Creek Indian Band	Chief and Council	nntc.referrals@nntc.ca	2504539098	Ashcroft
Skuppah Indian Band	Chief and Council	nntc.referrals@nntc.ca	2504552279	Lytton
Lower Nicola Indian Band	Chief and Council	fileclerk@lnib.net	2503785157	Merritt
Siska First Nation	Chief and Council	sts@siskaband.ca	2504552219	Lytton
Nicomen Band	Chief and Council	donna@nicomenband.com	2504552514	Lytton
Shackan Indian Band	Chief and Council	Heather.fader@shackan.ca	2503785410	Merritt
Coldwater Indian Band	Chief and Council	lspahan@coldwaterband.org	2503786174	Merritt
Nicola Tribal Association	Administration	referrals@scwexmxtribal.org	2503784235	Merritt
Cook's Ferry Indian Band	Chief and Council	eshknam.arch@gmail.com	2504582224	Merritt
Penticton Indian Band	Referrals Coordinator	referrals@pib.ca	2504930048	Penticton
Okanagan Nation Alliance	Tribal Council	referrals@syilx.org	2507070095	Westbank
Upper Nicola Band	Chief and Council	https://nationsconnect.ca/	2503503342	Merritt
Lower Similkameen Indian Band	Chief and Council	nicole.mack@lsib.net	2504995528	Cawston

6.9 APPENDIX J: GLOSSARY OF TERMS

Danger tree - A live or dead tree whose trunk, root system or branches have deteriorated or been damaged to such an extent as to be a potential danger to human safety.

Fire danger - A general term used to express an assessment of both fixed and changeable factors of the fire environment that determine the ease of ignition, rate of spread, difficulty of control, and fire impact.

Fire season - The period(s) of the year during which fires are likely to start, spread, and damage values-at-risk sufficient to warrant organized fire suppression; a period of the year set out and commonly referred to in fire prevention legislation.

Fuel - Fuel is any organic matter, living or dead, in the ground, on the ground, or in the air that can ignite and burn.

Available fuel - The quantity of fuel (in a particular fuel type) that would actually be consumed under specified burning conditions.

- *Fine fuels* - Fuels that ignite readily and are consumed rapidly by fire (e.g. cured grass, fallen leaves, needles, small twigs). Dead, fine fuels also dry very quickly.
- *Ground fuels* - All combustible materials below the litter layer of the forest floor that normally support smoldering or glowing combustion associated with ground fires (e.g. duff, roots, buried punky wood, peat).
- *Ladder fuels* - Fuels that provide vertical continuity between the surface fuels and crown fuels in a forest stand, thus contributing to the ease of torching and crowning (e.g. tall shrubs, small-sized trees, bark flakes, tree lichens).
- *Medium fuels* - Fuels too large to be ignited until after the leading edge of the fire front passes, but small enough to be completely consumed.
- *Surface fuels* - All combustible materials lying above the duff layer between the ground and ladder fuels that are responsible for propagating surface fires (e.g. litter, herbaceous vegetation, low and medium shrubs, tree seedlings, stumps, downed-dead roundwood).

Fuel management - Fuel management is the modification of forest structure to reduce forest fuel accumulations available to burn in a wildfire. The main goal of fuel management is improving public safety. This may include treatments such as thinning, spacing and pruning trees, and removal of needles and woody debris from the forest floor.

Fuel type - An identifiable association of fuel elements of distinctive species, form, size, arrangement, and continuity that will exhibit characteristic fire behaviour under defined burning conditions.

High risk activity - As defined in the Wildfire Regulation (s.1)

a) mechanical brushing;
b) disk trenching;

c) preparation or use of explosives;
d) using fire- or spark-producing tools, including cutting tools;
e) using or preparing fireworks or pyrotechnics;
f) grinding, including rail grinding;
g) mechanical land clearing;
h) clearing and maintaining rights of way, including grass mowing;
i) any of the following activities carried out in a cutblock excluding a road, landing, roadside work area or log sort area in the cutblock:
    i) operating a power saw;
    ii) mechanical tree felling, woody debris piling or tree processing, including de-limbing;
    iii) welding;
    iv) portable wood chipping, milling, processing or manufacturing;
    v) skidding logs or log forwarding unless it is improbable that the skidding or forwarding will result in the equipment contacting rock;
    vi) yarding logs using cable systems

Interface fire - Interface fires are fires that have the potential to involve buildings and forest fuel or vegetation simultaneously.

Prescribed fire - The knowledgeable and controlled application of fire to a specific area to accomplish planned resource management objectives. These fires are managed in such a way as to minimize the emission of smoke and maximize the benefits to the site.

Slash - Debris left as a result of forest and other vegetation being altered by forestry practices and other land use activities (e.g. timber harvesting, thinning and pruning, road construction, seismic line clearing). Slash includes material such as logs, splinters or chips, tree branches and tops, uprooted stumps, and broken or uprooted trees and shrubs.

Spot fire - A spot fire is one that is less than 0.01 hectares (10 metres by 10 metres).

Wildfire - An unplanned fire - including unauthorized human-caused fires - occurring on forest or range lands, burning forest vegetation, grass, brush, scrub, peat lands, or a prescribed fire set under regulation which spreads beyond the area authorized for burning.

Wildland urban interface - The wildland urban interface (WUI) is any area where combustible forest fuel is found adjacent to homes, farm structures or other outbuildings. This may occur at the interface, where development and forest fuel (vegetation) meet at a well-defined boundary, or in the intermix, where development and forest fuel intermingle with no clearly defined boundary.