City of Vernon

COMMUNITY WILDFIRE RESILIENCY PLAN

2024

BRITISH COLUMBIA FireSmart™

UBCM

FORSITE FIRE

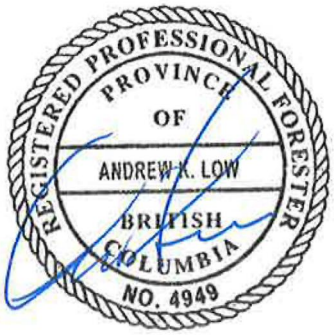
REGISTERED PROFESSIONAL SIGNATURE AND SEAL

This CWRP has been prepared for the City of Vernon.

RPF PRINTED NAME	RPF #
Andrew K. Low	RPF 4949
DATE SIGNED	
June 14, 2024	

I certify that the work described herein fulfills the standards expected of a registrant of the Forest Professionals British Columbia and that I did personally supervise the work.

REGISTERED PROFESSIONAL FORESTER SIGNATURE & SEAL



FORSITE
Forest Management Specialists

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ACKNOWLEDGMENTS

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

Forsite would like to acknowledge significant contributions from the following individuals during the building of this CWRP including:

- **Chief David Lind**, Director of Fire Rescue Services, City of Vernon
- **Mike Walroth**, Deputy Chief of Emergency Management, City of Vernon
- **Wes Brassard**, FireSmart Coordinator, City of Vernon
- **Darcy Macleod**, RPF, Wildfire Technician, BC Wildfire Service
- **City of Vernon**, All departments contributed through the City of Vernon FireSmart Taskforce
- **Andy Low,** RPF**,** Senior Wildland Fire Specialist, Forsite Consultants Ltd
- **Liam Curran,** FIT**,** Fuel Management Specialist, Forsite Consultants Ltd

FREQUENTLY USED ACRONYMS

AOI	Area of Interest
BC	British Columbia
BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CFFDRS	Canadian Forest Fire Danger Rating System
CFS	Community Funding and Support
CI	Critical infrastructure
CIFFC	Canadian Interagency Forest Fire Centre
CRI	Community Resiliency Investment
CWRP	Community Wildfire Resiliency Planning
DP	Development Permit
DPA	Development Permit Area
EMBC	Emergency Management British Columbia
EPA	Emergency Program Act
FBP	Fire Behaviour Prediction System
FESBC	Forest Enhancement Society of British Columbia
FESIMS	Forest Enhancement Society Information Management System
FMP	Fire Management Plan
FSCCRP	FireSmart Canada Community Recognition Program
FNESS	First Nations Emergency Services Society
HIZ	Home Ignition Zone (also see Structure Ignition Zone)
HRVA	Hazard Risk and Vulnerability Analysis
LRMP	Land and Resource Management Plan
MOF	Ministry of Forests
MOTI	Ministry of Transportation and Infrastructure
PSOE	Provincial State of Emergency
PSTA	Provincial Strategic Threat Assessment
OCP	Official Community Plan
OFC	Office of the Fire Commissioner
RSWAP	Resource Sharing Wildfire Allocation Protocol
SOLE	State of Local Emergency
SWPI	Strategic Wildfire Prevention Initiative
UBCM	Union of British Columbia Municipalities
VAR	Values at Risk
WRR	Wildfire Risk Reduction
WUI	Wildland Urban Interface

OPENING REMARKS – DIRECTOR, FIRE RESCUE SERVICES

March 1, 2024

The City of Vernon's most recent Community Wildfire Protection Plan (CWPP) was created on July 2, 2014. Since then, City staff have gained valuable experience in their efforts to better prepare for and respond to wildfire threats.

An important lesson learned over the past few years came from several fast-growing and large-scale fires in the Okanagan region. These fires demonstrated that ember casting can impact entire communities, not just the areas located in the interface zone. This new understanding should prompt a shift in our strategy for addressing wildfire risk. Instead of focusing solely on fire hardening values within the interface, we need a new approach that hardens as many values as possible throughout the entire community. When hot embers fall in a poorly prepared community, multiple values can ignite simultaneously, quickly overwhelming any fire response. The good news is that fuel treatments, thoughtful design, construction, and landscaping can make a significant difference. The community of Vernon has a wildfire risk that can be greatly reduced.

It is also evident that the solution to reducing wildfire risk lies in landscape-level treatments both around and within the community. All levels of government must continue to champion FireSmart work in their respective areas of care and control. This includes treating Crown lands near communities, conducting fuel reduction work in parks (which have historically been left in a "natural" state), and addressing challenges such as mature conifers and other fire hazards planted on City of Vernon lands.

Wildfires do not respect property or jurisdictional lines. To effectively reduce fire intensity and the rate of spread, conditions across the landscape must be changed. This work is essential for making early fire detection and an adequate firefighting response effective tool. Without mitigation of the fuel load, fires which occur during extreme conditions grow and spread to quickly to be suppressed.

Over the last several years, the City of Vernon has worked closely with SenseNet, a private company that has been developing new technology which promises to provide early detection of wildfires directly to fire services and emergency operations centers. The project represents a significant milestone—it is the first large-scale testing of this emergent technology. Nearly 150 sensors have been placed throughout the City of Vernon, and its capacity is expandable to include an unlimited number of sensors. Developers, strata boards, and other stakeholders can add to the system to better protect their specific values.

During the time of the 2014 City of Vernon CWPP, various entities, including councils, the province, city staff, developers, strata boards, and community members, have demonstrated sustained commitment to creating a wildfire-resilient community. Some of accomplishments include:

- The inclusion of FireSmart strategies as a priority for City Council.
- Creation of a City of Vernon FireSmart Task Force to ensure this priority is considered and actioned by City staff in a coordinated manner.
- Fuel treatment projects on Crown lands, private properties, strata developments, and city-owned lands.
- Demonstration projects, to create before-and-after comparisons, encouraging others to undertake similar work on their property.
- Implementation of FireSmart neighborhood programs and supports.
- Cross-training and equipping fire services for wildfire response.
- Engagement and cooperation to improve response with BC Wildfire and neighboring fire departments.
- Public education and open houses held to encourage cooperative efforts toward fire-hardening properties.
- City of Vernon Council advocating for mitigation work on crown lands within the City of Vernon boundaries and in the watershed.
- Treatments conducted on the landscapes around City of Vernon-owned buildings.
- FireSmart covenants implemented on developments within the wildland interface.

Despite the challenges faced – such as funding complexities, staff changes, and land ownership - the City has made progress. The creation of roles like the FireSmart Coordinator and Climate Action Specialist demonstrates an ongoing commitment to reducing the community wildfire risk. Residents involvement and the Provinces fuel treatments further enhance community safety.

Addressing wildfire risk today is an investment in the community's long-term well-being. There is a lot of work ahead, and a collective effort is vital. Together, we can build resilience and protect against devastating fires.

SUMMARY OF CWRP ACTIONS

RISK ASSESSMENT

The purpose of a risk assessment is to identify the specific risks to a community and its assets. An ongoing review of the risk assessment should occur annually.

Read and understand this CWRP's identified risks and recommended actions. The risks listed below were identified based on background research, field work data collection, conversations with the Vernon FireSmart Coordinator and BCWS staff. The risks are in no order of importance:

I. Land ownership within the City of Vernon is predominantly private (88%), underscoring the critical importance of a strong and robust FireSmart program.

II. The AOI is characterized by a dry climate and extreme heat events throughout the summer. This significantly increases fire danger.

III. The City of Vernon has a growing population which is seeing an increase of development in the wildland urban interface and ultimately increasing the exposure to a wildland fire event.

IV. The Eastside Rd area of Vernon along Okanagan Lake faces a significant fire threat risk, compounded by its rural population and reliance on a single egress route.

V. City owned land with fuel hazards including but not limited to boulevards, easements, right of ways, medians, etc.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
Education						
Objective						
1. Update and maintain the FireSmart webpage on the City of Vernon website.	FireSmart Coordinator, City of Vernon Communications staff.	Very High	Immediately.	Communication resources, web design services.	Webpage gets 10,000 views (20% of population) within first year of existence.	Make the following additions to the website: 1. Current CoV CWRP. 2. WUI and PSTA maps. 3. FireSmart Neighborhood Recognition Program (Vernon). 4. Annual FireSmart Events. 5. CoV FireSmart Programs and key information.
2. Promote FireSmart information and wildfire preparedness with social media.	FireSmart Coordinator, CoV Communications staff, potential FireSmart Student Intern.	High	By April 2024, then ongoing with a focus on posting during fire season months.	Communication resources, social media, FireSmart Social Media Handbook[1].	10 posts related to FireSmart content within first 6 months.	FireSmart BC posts and promotes wildfire information regularly and CoV social media could repost content and tailor it to Vernon. Posts should focus on recognizing local efforts like recognized neighborhoods and local FireSmart programs or events. This will increase engagement and local awareness.

[1] FireSmart Social Media Handbook.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
3. Develop a communication strategy regarding FireSmart education on wildfire risk and the CWRP priority mitigation measures that are being undertaken within and by the community.	FireSmart Coordinator, CoV Communications Staff.	High	Over the next 5 years, starting in 2024.	Public engagement, communication resources and coordination with CoV staff.	Communication strategy is developed with an implementation plan that includes methods and timelines.	Includes: • a prework phase that reviews what strategies were successful in other communities – from which to base the communication strategy upon, • identification of outreach tools for executing CWRP goals, • methods for communicating with different audiences, • effort and resource requirements, • priority levels and timelines.
4. Organize a Wildfire Community Preparedness Day on an annual basis to promote the principles of FireSmart and increase community engagement. This should be held annually between May and October.	FireSmart Coordinator, CoV Fire Rescue Service	Very High	One per year, starting in 2024.	Funding is available through FireSmart Canada CRI funding[2].	100 people in attendance for the first year.	Funding is available through the UBCM's Community Resiliency Investment (CRI) program to help organize, host and support FireSmart events[3].

[2] FireSmart Community Funding and Supports. UBCM.
[3] Wildfire Community Preparedness Day. FireSmart Canada.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
5. Increase Vernon Fire Rescue Service involvement with FireSmart promotion in community.	Vernon Fire Rescue Service, FireSmart Coordinator.	High	Immediate and ongoing.	Collaboration and planning between services.	Host two events within first 24 months.	Host community FireSmart events, local FireSmart presentations in schools and booths/outreach at local events like Farmers Market, career days and festivals. Engage with BCWS to collaborate on outreach program. This will ensure a coordinated and effective approach to promoting FireSmart in the community.
6. Make available FireSmart BC education materials into School District 22 curriculum.	FireSmart Coordinator, School District 22 Representative.	Moderate	24 months starting in 2024.	Education resources and materials[4].	FireSmart education materials implemented into curriculum within timeframe.	Opportunity to educate youth and spread awareness regarding FireSmart program. May be outside of the sphere of influence if no uptake by SD 22.
7. Offer Home Ignition Zone assessments for residents in high priority neighborhoods and encourage residents to implement recommendations from the assessment.	FireSmart Coordinator.	Very High	24 months starting in 2024.	Local FireSmart Representatives, CRI funding.	Number of residents engaged with.	High percentage of AOI is private land, residents need to engage with FireSmart disciplines.

[4] Education Materials. FireSmart BC.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
8. Increase CoV FireSmart Capacity. Hire summer students and term Wildfire Mitigation Specialists.	FireSmart Coordinator, Vernon Fire Rescue Services	High	Ongoing	CRI Funding, FireSmart pdf Job Descriptions Guideline	FireSmart summer students hired for summer 2024. Job posting for Wildfire Mitigation Specialists.	Expanding staff will increase the City of Vernon's capability to address the action items delineated in this CWRP.
Legislation and Planning						
Objective						
9. As updates and amendments are made to the CoV City Plan, Emergency Plan and other planning documents, incorporate consistent FireSmart planning objectives, language and terminology.	FireSmart Coordinator, CoV Community Infrastructure and Development Department.	High	Ongoing.	CRI funding.	Next generation city plans should reflect current FireSmart language and terminology.	Funding is available through the UBCM's CRI program to amend Official Community Plans, Comprehensive Community Plans and/or land use, engineering and public works bylaws to incorporate FireSmart principles.
10. Explore updating Bylaws to prohibit fireworks and campfires during high fire risk period of the year.	CoV City Council, Vernon Fire Rescue Service	Moderate	2024 - 2028	Local government funding.	Fire Service Bylaw #5635 is updated.	N/A.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
11. Increase fines for repeat or egregious behavior	CoV City Council, Vernon Fire Rescue Service	Moderate	2024-2028.	City funding.	Update relevant policy and laws.	N/A.
12. Amend any existing bylaws regarding boulevards or easements to: (i) prohibit residents from planting/growing any vegetation on City property, (ii) prohibit planting of coniferous shrubs and trees on City property by residents, (iii) replace existing coniferous vegetation with deciduous.	Vernon Fire Rescue Service, Vernon Planning Department	Moderate	2024-2028.	CRI funding.	Bylaws are updated.	CRI funding is available to amend Official Community Plans, Comprehensive Community Plans and/or land use, engineering and public works bylaws to incorporate FireSmart principles.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
13. Prohibit planting of coniferous trees & shrubs on private property within 10m of homes or structures or for the purposes of privacy screening: (i) property owners may replace existing coniferous vegetation with deciduous; or (ii) seek exemption of height restrictions on fencing from the City.	Vernon Fire Rescue Service, Vernon Planning Department	Moderate	2024-2028.	CRI funding.	Bylaws are updated.	CRI funding is available to amend Official Community Plans, Comprehensive Community Plans and/or land use, engineering and public works bylaws to incorporate FireSmart principles.
14. Amend any existing bylaws for fence heights along roadways or public corridors to allow for exemptions from fencing height bylaws for taller fences for privacy & noise reduction. Alternatively, provide a streamlined process for exemption request to build taller fences adjacent to roadways or public corridors.	Vernon Fire Rescue Service, Vernon Planning Department	Moderate	2024-2028.	CRI funding.	Bylaws are updated.	Intent is to discourage residents from planting/growing coniferous trees and shrubs. CRI funding is available to amend Official Community Plans, Comprehensive Community Plans and/or land use, engineering and public works bylaws to incorporate FireSmart principles.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
Development Considerations						
Objective						
15. Use the FireSmart Critical Infrastructure Guide and Hazard Assessment Form to assess critical infrastructure vulnerability to wildfire in AOI.	FireSmart Coordinator or qualified Local FireSmart Representative.	Very High	36 months starting in 2024.	Local FireSmart Representative, CRI funding[5].	Assessment forms for identified critical infrastructure located within AOI completed.	Assessments will identify vulnerabilities and CoV can work towards reducing the risk of prioritized critical infrastructure.
16. Upgrades or development of new critical infrastructure should be based on outcomes from the Critical Infrastructure FireSmart Assessment and constructed with fire-resistant construction materials.	City of Vernon - Community Infrastructure and Development Department, City of Vernon Operations Services, FireSmart Coordinator.	Very High	Ongoing.	Local government funding.	Critical infrastructure upgrades adopt FireSmart principles.	Funding is available through the UBCM's CRI program to complete FireSmart assessments for publicly owned buildings and critical infrastructure. Funding is also available to complete mitigation activities on assessed structures, including building materials and labor.

[5] FireSmart Critical Infrastructure Guide. FireSmart BC.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
17. Construct perimeter trails in Interface Areas 2 and 3 as previously identified in the 2014 CWPP.	FireSmart Coordinator, CoV Community Infrastructure and Development Department, CoV Recreation Services.	Moderate	2024-2028.	Trail planning and development resources and labor, CRI funding.	Perimeter trails are fully constructed by 2028.	Perimeter trails will reduce the fuel loading adjacent to homes and increase accessibility to first responders.
18. Establish a Development Permit Area (DPA) for Wildfire Protection for new development/buildings within the identified Interface Areas to require fire resistant landscaping or other FireSmart considerations, such as fire-resistant building materials for roofs, decking, etc.	CoV Community Infrastructure and Development Department, FireSmart Coordinator.	Very High	2024-2027.	CoV Planning staff, Public Engagement and communication resources, potential legal oversight.	Development Permits are implemented and limit building materials and landscaping vegetation that are a high fire hazard.	Funding is available through the UBCM's CRI program to establish Development Permit Areas for Wildfire Hazard to incorporate FireSmart principles.
Interagency Cooperation						
Objective						

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
19. Maintain active engagement and participation in the established Community FireSmart and Resiliency Committee (CFRC) (required by 2024 for success to CRI funding).	FireSmart Coordinator, CoV Fire Rescue and Emergency Management.	Very High	Ongoing.	Communication resources.	At least one CFRC meeting is held annually.	CoV is already part of a Resiliency Committee and has an internal FireSmart Taskforce
20. Engage with operators (e.g., BC Hydro, Fortis BC, Vernon Airport) to encourage completion of FireSmart assessments for privately owned critical or hazardous infrastructure.	City of Vernon Community Infrastructure and Development Department, private operators.	Moderate	2024-2027.	CRI funding or local government funding.	Critical infrastructure assessments completed for privately owned critical infrastructure.	City of Vernon depends on critical infrastructure that is not publicly owned, efforts should be made to collaboratively increase resiliency.
21. Engage with Department of National Defense to assess wildfire risk on their private land.	City of Vernon – Community Infrastructure and Development Department, Vernon FireSmart Coordinator.	Moderate	2024-2028.	Local government funding.	Build relationship with program lead.	Department of National Defense owns large amount of private land within AOI. Efforts should made to assess the wildfire risk in this area and work towards increasing resiliency.
Cross-Training						

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
Objective						
22. Conduct annual multi-agency training exercises focused on interface wildfire response with BCWS.	Vernon Fire Rescue Services, BC Wildfire Service Vernon Zone.	Moderate	Ongoing.	N/A.	Hold two training exercises per year.	Increasing interagency collaboration improves skill development, and provides opportunity to assess and improve response capabilities.
23. Continue to support and celebrate the BCWS Vernon Zone Junior Wildfire Firefighter Program.	School District 22 Lead, BCWS Vernon Fire Zone lead, Vernon CoV FireSmart Coordinator	Moderate	Ongoing.	N/A.	Continued utilization of the BCWS Vernon Fire Zone Junior Program.	A chance for local students to gain professional experience in wildland fire, fostering community engagement and raising awareness of wildfire.
24. Continue to provide S100 training to CoV operation workers.	Vernon Fire Rescue Services, Vernon CoV FireSmart Coordinator	High	Ongoing.	CoV Operations Services, Vernon Fire Rescue Services.	50% of operation workers certified.	S100 certified operation workers were utilized during the 2021 White Rock Lake fire as water tender drivers.
Emergency Planning						
Objective						

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
25. Promote and encourage Vernon residents to sign-up for the CoV Emergency Alert Notifications through social media, newspaper, radio etc.	Vernon Fire Rescue Services, CoV Communications staff.	Very High	Immediate and ongoing.	Communication resources.	Have 75% of the population signed up.	CoV can improve public awareness to emergencies and facilitate prompt communications during emergency.
26. Complete annual testing of Emergency Management Plan.	City of Vernon Fire Rescue Services and Emergency Management staff, RCMP, SAR and other relevant emergency response personnel.	Very High	Ongoing (annual occurrence).	Communication resources.	Annual testing occurs and community members are aware of emergency response procedures in the plan.	Testing response plan will increase efficiency of response and identify areas where the response is weak and can be improved. This will increase the City of Vernon's capacity to respond to a wildfire event.
27. Create a wildfire incident pre-plan and test annually.	Vernon Fire Rescue Services.	Very High	2024-2026.	CRI funding.	Pre-plan completed.	Opportunity exists to have cross training exercises with city partners, such as table-top exercises or mock-up responses. Pre-plan will streamline response to a wildfire event.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
28. Identify municipal buildings that can be used as clean air shelters for public during times of poor air quality for public.	City of Vernon Fire Rescue Services and Emergency Management.	Moderate	2024-2027.	Local government funding.	Communicated to public through local media.	High health risks exist from exposure to wildfire smoke. Prevalence of wildfire smoke is increasing in Okanagan during wildfire season. Consider Turning Points, Hospital, Library and Village Green Mall for locations.
29. Develop local daily action guidelines based on expected wildfire conditions and preparedness levels.	Vernon Fire Rescue Services, BC Wildfire Service.	Moderate	2024-2027	Local government funding.	Guidelines in place.	Use Canada's National Guide for WUI fires as guidance.
30. Explore opportunities for secondary egress routes across the municipality in high-risk areas.	Vernon Fire Rescue Services and Emergency Management.	High	2024-2026.	Emergency Management planning resources.	Explored opportunities for secondary egress routes by 2026.	Several regions within the municipality currently only have one egress route.
Vegetation Management						
Objective						

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
31. Continue to apply for funding to complete proposed fuel management treatments in remaining identified areas from the 2014 CWPP and 2024 CWRP.	FireSmart Coordinator.	High	Annually.	An RPF is required to write the fuel management prescription.	Ongoing applications for funding.	Funding is available through the CRI program for both prescription development and operational work. CoV will also continue to access funds through FESBC.
32. Implement a monitoring and maintenance program for completed fuel treatment areas that includes a database outlining treatment strategies, dates, and spatial information.	FireSmart Coordinator, CoV GIS staff.	Very High	Within 2 years (2026).	A qualified RPF to assess treated stands and help develop plan.	A monitoring and maintenance plan is developed and ready for implementation by 2026.	Multiple identified FTUs have already been treated. Moving forward it is crucial to monitor and conduct maintenance treatments on existing FTUs.
33. Work with First Nation partners to develop a prescribed fire and cultural burning program and relationship.	FireSmart Coordinator, First Nation partners, BCWS.	High	Ongoing.	BCWS support and involvement.	Collaboration on one cultural burn by end of 2025.	Funding is available through UBCM's CRI program to support and participate in an integrated fuel management, cultural burning and/or prescribed fire planning table (generally led by Ministry staff in collaboration with communities) to support the integration of fuel management planning across jurisdictional boundaries.

CITY OF VERNON CWRP ACTION PLAN						
Action	**Lead(s)**	**Priority**	**Timeframe**	**Resources Required**	**Metric for Success**	**Rationale/Notes**
34. Promote FireSmart vegetation management principals to private landowners using the FireSmart BC Landscaping Guide.	FireSmart Coordinator	High	Ongoing.	FireSmart BC resources[6].	Engagement and uptake of resources by local community.	N/A.

[6] FireSmart BC Landscaping Guide. FireSmart BC.

1. INTRODUCTION

In British Columbia, four of the most severe wildfire seasons of the last century have unfolded in the past seven years: 2017, 2018, 2021, and 2023. Among the affected regions, the City of Vernon, situated in the Okanagan Valley, has felt the impact, particularly from significant landscape fires like the White Rock Lake wildfire during the 2021 wildfire season. These recurring events underscore the necessity for deliberate and effective wildfire risk prevention measures, especially within the wildland-urban interface (WUI).

1.1 OVERVIEW

This Community Wildfire Resiliency Plan (CWRP) has been prepared to assess wildfire threat and provide action items and recommendations that reflect local priorities and provincial goals for wildfire mitigation. Provincial goals of the CWRP planning process include:

- increasing communities' capacity and understanding of wildfire risk;
- foster greater collaboration across administrative boundaries;
- be more responsive to the needs of different types of communities throughout BC in terms of their size, capacity, and threats they face; and
- develop achievable and accountable action items for effectively reducing wildfire threat and risk.

It is crucial to prioritize FireSmart values at risk and extend fuel management efforts outward through and beyond the Wildland-Urban Interface (WUI), aiming for landscape-level mitigation. However, achieving wildfire resilience also hinges on robust local policies, effective emergency response planning, communication strategies, comprehensive training programs, and community engagement across all seven FireSmart disciplines. This CWRP leverages the seven FireSmart disciplines outlined by FireSmart Canada to develop a comprehensive strategy aimed at enhancing resilience to wildfires.

1.2 PLAN GOALS

The overarching goal of the City of Vernon's CWRP is to identify and prioritize actions that are intended to increase the area's resiliency to wildfire, and to reduce the likelihood of devastating losses from a wildfire.

Goals of this CWRP include:

1. To develop local education strategies to help community members learn about wildfire, its potential impacts, and actions they can take to reduce overall wildfire risk to their properties.

2. To examine possible mechanisms to treat large tracts of private forested land that exist within and around the CWRP AOI.
3. To identify opportunities for the city to implement wildfire risk reduction actions through bylaws and other forms of community planning. The City of Vernon is in the process of updating the *Tree Protection Bylaw #4152* to adopt FireSmart principals.
4. To review the City of Vernon's *2013 Official Community Plan Bylaw #5470,* including the Wildfire Development Permit Area and subdivision standards and identify development considerations to increase public and first responder safety, as well as survivability of homes, critical infrastructure, and other community features.
5. To develop interagency cooperation strategies to improve collaboration between emergency response staff, government agencies at various levels, local stakeholder groups, and First Nations to enhance coordinated wildfire and emergency response within the City of Vernon's AOI.
6. To identify cross-training opportunities that will enable structural firefighters and other emergency response individuals to increase their knowledge of wildfire suppression tactics, incident response, and overall wildfire resiliency planning.
7. To develop and/or improve emergency planning strategies for local government and emergency response agencies in the City of Vernon AOI to enable effective response to a wildfire event and enhance public safety.
8. To identify vegetation management activities at the individual property level, the local government level, and the adjacent landscape level that are intended to reduce potential wildfire intensity and ember transport to improve fire suppression efforts, and to minimize devastating losses to life and property from a wildfire.

1.3 PLAN DEVELOPMENT SUMMARY

Forsite Consultants Ltd. (Forsite) was retained as the consulting firm to develop the 2024 CWRP for the City of Vernon. As forest professionals qualified in all aspects of wildland fire management, qualified Forsite Fire staff conducted the field assessments, analysis, treatment recommendation design and report compilation.

Background information was gathered and summarized in conjunction with completing GIS analysis based on local fire weather information and applicable spatial data. Office prework was conducted using Google Earth and mapping products prior to fieldwork. Fieldwork included a reconnaissance of the AOI as well as the completion of plots for the local wildfire threat assessment.

A thorough analysis of all background information and fieldwork data was conducted to develop key recommendations and actions for each FireSmart discipline. Actions are presented to support stated objectives, and were written in terms of **SMART** goal criteria, to ensure they are **S**pecific, **M**easurable, **A**chievable, **R**ealistic, and **T**ime-bound.

2. RELATIONSHIP TO OTHER PLANS

As was recently experienced during the 2021 wildfire season, wildfire can affect many aspects of a community; therefore, it is essential to be aware of how other plans relate to this CWRP and contain helpful information for the planning process. Additionally, as other land use and city plans are updated and revised occasionally, the CWRP should be reviewed to encourage information and goal/objective continuity. This section helps users identify which plans to consider during the development process and implementation of this CWRP.

2.1 LINKAGES TO OTHER CWPPS/CWRPS

A CWPP was completed in 2014; the report informs urban wildfire interface risks within the City of Vernon. In addition, the plan guides mitigation efforts and informs bylaws and new development. Some recent examples of work completed under the previous CWPP to reduce wildfire threat are; fuel reduction work in Predator Ridge, Deer Park and Ellison Park[7].

2.2 LINKAGES TO OTHER PLANS

Table 1 includes a list of other applicable plans, with descriptions, relationship to the CWRP, and additional information.

Table 1. Key plans and their relationship to the CWRP.

Plan Type	Description	Relationship to CWRP
City of Vernon – Official Community Plan 2013 (Bylaw #5470)	Plan defines the vision of the community and how the community sees itself growing and developing in the future.	Plan Provides community demographic and growth trends and outlines polices related to wildfire. • **22.0 – Fire Interface (pg. 125)**
Vernon Climate Action Plan (2021)	Plan identifies and prioritizes future work and aligns with the vision and guiding principals outlined in the Official Community Plan. The plan outlines a plan for Vernon to reduce emissions and prepare for the impacts of climate change.	Wildfire is referenced several times in the document including as Action Items: • **Core Services & Infrastructure – Goal 1 – Update CWPP (pg. 21)** • **Core Service & Infrastructure –- Goal 3 – Develop Extreme Heat and Clean Air Response Strategy (pg. 23)**

[7] Eight Year Strategic Plan 2018-2025. Vernon Fire Rescue Services.

Plan Type	Description	Relationship to CWRP
City of Vernon – Emergency Management Plan (2022)	Plan follows the principals and framework provided by the Province, through the British Columbia Emergency Management System (BCEMS) and the BC Emergency Program Act and Regulations.	Wildfire is referenced several times in document: • **Hazard Specific Emergency Guidelines – Wildfire (pg. 76)** • **Hazard Risk and Vulnerability Assessment (HRVA) (pg. 78)**
Council Strategic Plan – Action Plan (2023-2026)	Focus on policies and systems that can provide residents a community where they can thrive.	Plan identifies wildfire as an area of focus. • **Area of Focus** – Building Resilience and Wildfire Management
Vernon Fire Rescue Services Eight Year Strategic Plan (2018-2025)	Report identifies Administration's best professional advice for moving VFRS closer to meeting responsible standards and practices. Plan addresses key enablers for the provision of reliable and safe service.	Plan includes relevant information like the resources allocated to VFRS.
Okanagan Shuswap Land and Resource Management Plan (2001)	This plan contains high-level resource management objectives that can provide guidance, or in some cases legal direction for CWRP implementation.	N/A.
2022 Wildfire Risk Reduction Strategy for City Owned Lands (2022)	Plan details the state of vegetation on city owned parcels, their potential fire behavior, how to best mitigate fire behavior, and when and how often to apply vegetation/fuel management actions.	Plan identifies priority areas for fuel management and recommended treatments.
Vernon Community Wildfire Protection Plan (2014)	Focus of CWPP is to provide the City of Vernon with a realistic plan that provides meaningful guidance to their operations and specifically the management and implementation of the fire risk and wildfire protection across the community.	Recommendations and identified fuel treatment units from the CWPP are relevant to the new CWRP.

3. COMMUNITY DESCRIPTION

The City of Vernon is situated in the southern interior of British Columbia, within the Regional District of North Okanagan (RDNO). It shares borders with the District of Coldstream and Electoral Areas B and C. Furthermore, the municipal boundary of Vernon is adjacent to two reserves belonging to the Okanagan Indian Band.

Vernon is a popular tourist destination, surrounded by stunning lakes such as Okanagan, Kalamalka, and Swan. Outdoor recreational activities attract visitors who are drawn to nearby attractions like SilverStar Mountain and Predator Ridge Resort. The city has experienced significant population growth, with a notable 11% increase from 2016 to 2021, resulting in a population of 44,519 residents. Projections indicate a forecasted 17.2% increase in population for the RDNO by 2040[8].

3.1 AREA OF INTEREST

The Area of Interest (AOI) describes the study area where most of the human population and other values at risk are located. The CRI program provides guidance for defining the AOI, which varies depending on the type of local government (e.g., municipality versus a regional district) and structure density. For the purpose of this CWRP, the AOI was established as the municipal lands located within the boundary of the City of Vernon and covers a total area of 11,662.90 ha (**Figure 1**).

[8] 2020 Community Profile. Vernon, British Columbia.

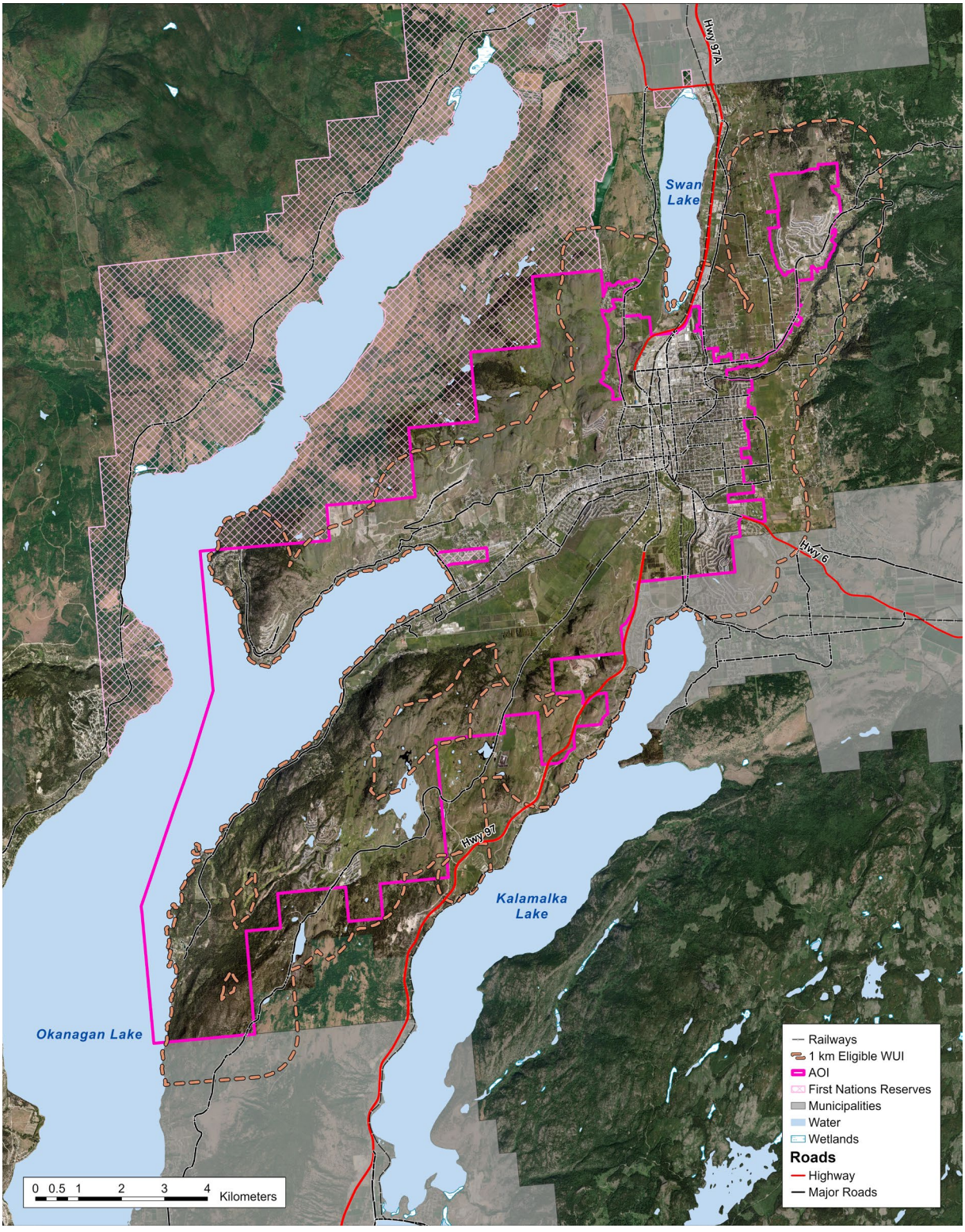

Figure 1. Vernon AOI and WUI Boundary with a 1 km buffer.

3.2 WILDLAND-URBAN INTERFACE

The BC Wildfire Service defines the Wildland Urban Interface (WUI) as "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"[9]. The Provincial Strategic Threat Analysis (PSTA), Wildland Urban Interface (WUI), and WUI risk class maps and data have been obtained from the BCWS through the BC Data Catalogue[10]. The WUI polygons are different from the AOI, as they were created by buffering the structure density class greater than six by a two-kilometer buffer, which represents a reasonable distance that embers can travel from a wildfire to ignite a structure.

The FireSmart Community Funding & Supports program (FCFS) defines the 'eligible WUI' is as a **maximum of one kilometer from the structure density class greater than 6**. For the purposes of receiving funding under the FCFS for action items within this CWRP, the WUI areas within the City of Vernon were delineated based on the eligible WUI definition[11].

3.3 COMMUNITY INFORMATION

Vernon has surpassed population growth estimates by an impressive margin, achieving projections initially set for 2036 nearly 13 years ahead of schedule. Initial estimates anticipated the city reaching a population of 45,000 residents by 2036. However, by the end of 2023, Vernon was already approaching this milestone[12]. As a regional hub for retailing and services in the Regional District of North Okanagan (RDNO), Vernon provides essential services not available in rural or surrounding areas. The city faces development pressure due to the focus on developing farmland, hillsides, and areas within and bordering the wildland-urban interface.

Vernon is characterized by urban development at the valley bottom, with neighborhoods spread throughout the periphery of the city boundaries on hillsides and forested lands in the wildland-urban interface. Neighborhoods along Okanagan Lake, like Sunset Properties and Adventure Bay, depend on one road in and out access into Vernon. The City of Vernon desires to improve safe alternatives, like secondary egress routes or established safe zones for these identified areas. Primary transportation corridors that would be used to evacuate the city are Highway 97, which leads north to Kamloops and south to Kelowna, and Highway 6 which leads east to Lumby.

Vernon Fire Rescue Services (VFRS) provide first medical responder and fire suppression services, with resources located at two full-time fire halls and one fire hall staffed during periods of extreme

[9] Wildland Urban Interface Risk Class Maps. BC Wildfire Service
[10] Fire and Fuel Management. BC Wildfire Service.
[11] FireSmart Community Funding and Supports.
[12] Vernon hits population growth targets 13 years ahead of schedule. Castanet News.

risk in the community in Predator Ridge. The VFRS employs 36 career full-time firefighters and 15 auxiliary firefighters (**Table 2**).

Table 2. Fire hall stations and staffing for the City of Vernon.

Fire Hall	*Location*	*Staffing*
Fire Station 1	3401 30th St	Full Time
Fire Station 2	7210 Okanagan Landing Rd	Full Time
Fire Station 3	70 Predator Ridge Dr	During extreme risk periods

3.3.1 HUMAN LIFE AND SAFETY

In the event of a threatening wildfire, the highest priority is to protect human life and safety, which often requires evacuating areas at risk. Evacuations take time, despite sometimes quick and unpredictable wildfire behaviour. Safe egress may become blocked by vehicle congestion, accidents, or the wildfire itself. The City of Vernon has validated evacuation zone guidance documents for all high-risk interface areas and these areas are reviewed annually.

As of the most recent census in 2021, Vernon's population was just under 44,520 people, representing an 11% increase from the previous census in 2016[13]. Population density is 461.6 people per square kilometer, which is higher than the overall RDNO at 12.2 people per square kilometre, as seen in **Table 3**.

Table 3. Community profile for the City of Vernon, with RDNO and the Province of BC for comparison.

Characteristic	*Vernon*	*RDNO*	*BC*
Population (2021)	44,519	91,610	5,000,878
Population (2016)	40,116	84,344	4,646,055
Population percentage change (2016 to 2021)	11%	9%	8%
Total private dwellings	21,287	42,722	2,211,694
Private dwellings occupied by usual residents	19,776	38,821	2,041,834
Median Household Income	$ 73,500.00	$ 77,500.00	$ 85,000.00
Median Home Value	$ 524,000.00	$ 560,000.00	$ 785,000.00
Population density (people per sq.km)	461.7	12.2	5.4
Land area in (km^2)	96.43	7,497.23	920,686.55
Median age of the population (years)	49.2	50	42.8
Unemployment rate	8.2	8.2	8.4

[13] Census Profile, 2021 Census of Population. Statistics Canada.

As listed in **Table 3**, the median age in Vernon is approximately 49 years old. The age distribution for this area is presented in **Figure 2**, with a comparison graph for all of BC. It is important to highlight that the City of Vernon has a higher proportion of seniors (over the age of 65 years) than the provincial average in British Columbia.

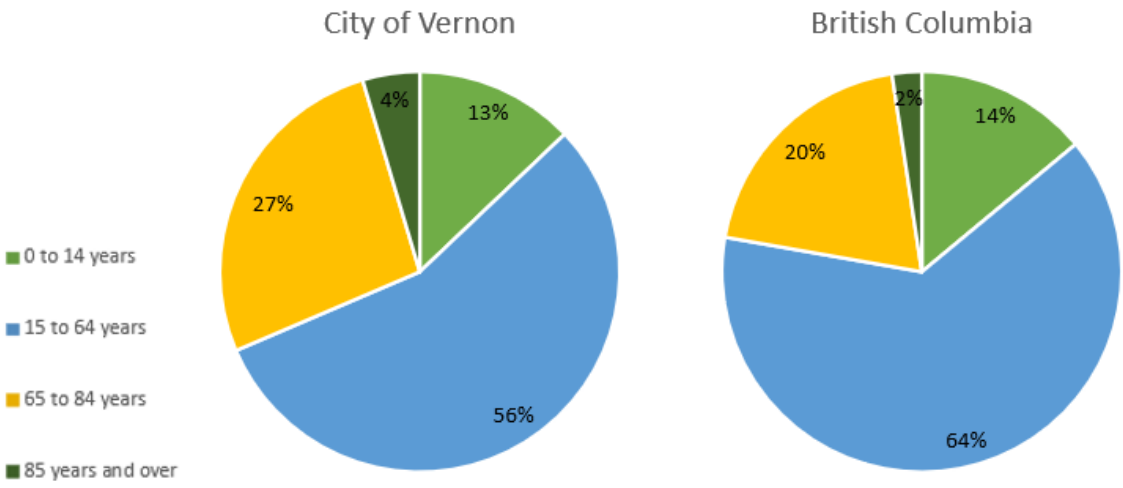

Figure 2. Age distribution for the City of Vernon, age distribution for the Province of British Columbia is provided for comparison.

Recent studies have shown that wildfire impacts are not solely limited to property damage. Wildfire smoke contains several hundred compounds, including carcinogenic gases such as carbon monoxide, nitrogen oxides and particulate matter (PM), a mix of microscopic solid particles and liquid droplets containing organic and black carbon[14]. In addition, smoke from boreal and temperate forests contain fine particles less than 2.5 micrometers (μm), referred to as PM2.5. Even short-term exposure to the PM2.5 found in wildfire smoke can be detrimental to public health due to its ability to infiltrate deep into the respiratory system[15].

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

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

[14] Woodsmoke Health Effects: A Review. Inhalation Toxicology. https://doi.org/10.1080/08958370600985875
[15] Evidence Review: Wildfire smoke and public health risk. BC Centre for Disease Control.

3.3.2 ECONOMIC DRIVERS

An economically diverse community, Vernon is the economic anchor of the North Okanagan, serving a regional population of more than 100,000 people[16]. Historically agriculture has been the main economic engine of the area; however, resource activities, manufacturing, tourism, government, professional service, and retail services make valuable contributions to the local labour force as seen in **Table 4**. Interior Health, School District 22, Tolko Industries, Kal Tire, Sparkling Hill Resort, and Silver Star Mountain Resort are leading employers.

Table 4. Total labor force aged 15 and over by industry, City of Vernon, 2021 Census (North American industry Classification System (NAICS) 2017).

	City of Vernon		*RDNO*		*BC*
Characteristic	**#**	**%**	**#**	**%**	**%**
Retail trade	3,400	16%	5,920	14%	11%
Health care and social assistance	3,160	15%	5,970	14%	12%
Construction	2,065	10%	4,775	11%	9%
Accommodation and food services	1,690	8%	2,860	7%	7%
Manufacturing	1,455	7%	3,385	8%	6%
Professional, scientific and technical services	1,290	6%	2,695	6%	9%
Educational services	1,180	6%	2,585	6%	7%
Other services (except public administration)	955	5%	2,055	5%	4%
Administrative and support, waste management and remediation services	815	4%	1,665	4%	4%
Transportation and warehousing	785	4%	1,620	4%	5%
Public administration	645	3%	1,430	3%	5%
Wholesale trade	575	3%	1,185	3%	3%
Arts, entertainment and recreation	560	3%	1,065	2%	2%
Finance and insurance	465	2%	970	2%	4%

[16] 2020 Community Profile. Vernon, British Columbia.

	City of Vernon		RDNO		BC
Agriculture, forestry, fishing and hunting	450	2%	2,210	5%	2%
Industry - not applicable	395	2%	790	2%	2%
Real estate and rental and leasing	380	2%	755	2%	2%
Utilities	220	1%	445	1%	1%
Information and cultural industries	210	1%	390	1%	3%
Mining, quarrying, and oil and gas extraction	185	1%	590	1%	1%
Management of companies and enterprises	40	0%	90	0%	0%
Total Labor Force	**20,920**	**100%**	**43,450**	**100%**	**100%**

3.3.3 LAND OWNERSHIP

Within the City of Vernon's boundaries, most land (88.0%) is privately owned, as indicated in **Table 5**. Other contributors to land ownership include municipal lands (4.3%), crown provincial (2.9%), and federal (2.1%). Notably, the federal lands are under the ownership of the *Department of National Defense*, and this area is primarily characterized by open grassland.

Table 5. Land ownership types within the City of Vernon municipal boundary.

Type	Area (ha)	Percentage (%)
Private	16,093.65	88.0%
Municipal	780.83	4.3%
Crown Provincial	521.55	2.9%
Federal	391.59	2.1%
Unclassified	363.66	2.0%
Untitled Provincial	117.19	0.6%
Crown Agency	28.54	0.2%
Mixed Ownership	1.06	0.0%
Total	18,298.07	100.0%

3.3.4 CRITICAL INFRASTRUCTURE

Critical infrastructure assets are essential to a community's health, safety, security, or economic well-being. **Figure 3** captures critical infrastructure within the City of Vernon municipal boundary and surrounding area. Several transmission lines, emergency operation cell towers and water pump locations exist within the wildland-urban interface.

Vernon Fire Rescue Services is also concerned about the vulnerability of wooden poles to fire and the potential for burnt poles or compromised electric lines to block egress from a major wildfire event (**Figure 4**).

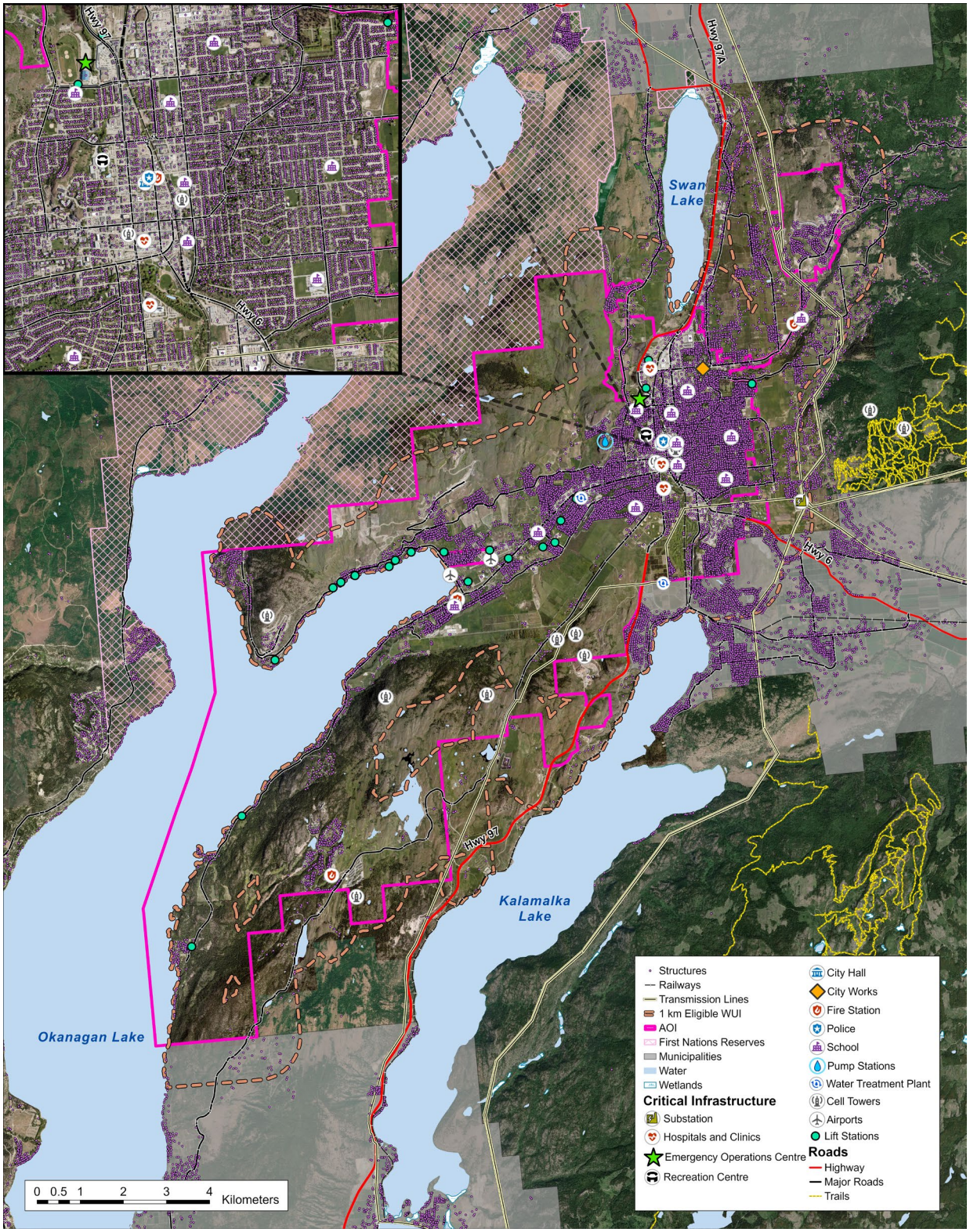

Figure 3. Vernon CWRP identified critical infrastructure.

Figure 4. Example of wooden power poles located on an egress route within the CWRP AOI.

3.3.5 COMMUNITY WATERSHEDS AND WATER SUPPLY

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

Greater Vernon Water (GVW) holds 57 water licenses and supplies water from Duteau Creek, Kalamalka Lake, Okanagan Lake, King Edward Lake, and four groundwater wells. There are over 20,000 residential connections, 700 agricultural connections, and 1,300 commercial/industrial connections. Over 58,000 residents receive their water supply from the GVW sources. Duteau Community Watershed, characterized by Duteau Creek flowing north from the Aberdeen Plateau, is

the largest supplier of water and encompasses an area exceeding 213 square kilometers[17]. The creek flows forth from several reservoirs with dams on Grizzly, Aberdeen, and Haddo Lakes on the plateau before being stored prior to treatment in Lake Harvey.

3.3.6 CULTURAL VALUES

As discussed in the *2023 – 2026 Council Strategic Plan,* the City of Vernon Council is committed to taking meaningful steps toward reconciliation with Indigenous Peoples and consistently seeks opportunities to collaborate with the Okanagan Indian Band.

Indigenous cultural heritage values include archaeological sites, traditional use sites, historic buildings and artefacts, heritage trails, or any other objects or places of historical, cultural or archaeological significance to British Columbia, a community or an aboriginal people[18].

Archaeological sites in British Columbia that date to 1846 or earlier are protected from alteration of any kind by the *Heritage Conservation Act* (HCA) (1996). The provisions of the HCA apply to archaeological sites located on both public and private land, known and unknown, and are binding on government. The Archaeology Branch of the Ministry of Forests administers the provisions of the HCA and are responsible for making decisions concerning archaeological resource management.

Cultural heritage sites in BC are generally not shared with the public due to their sensitive and confidential nature. Local First Nations have the right to keep access to these resources private. Due to an extensive and uninterrupted First Nation presence throughout the region, wildfire and associated suppression operations have the potential to inadvertently seriously impact or destroy cultural heritage resources.

3.3.7 HIGH ENVIRONMENTAL VALUES

The BC Conservation Data Centre (CDC) provides information about species and ecosystems at risk through the BC Species and Ecosystems Explorer, and CDC iMap[19]. Recorded occurrences of Red and Blue listed animals and ecological plant communities at risk within the AOI have been summarized in **Table 6**. Red listed species represent any species or ecosystem that is at risk of being lost (extirpated, endangered or threatened). Blue listed species are any species or ecosystem that is of special concern.

[17] Community Watersheds. Province of BC.
[18] Cultural Heritage Resource Identification and Management in Forestry Developments: A Supplement to the FREP Protocol. Ministry of Forest Land and Natural Resource Operations.
[19] BC Conservation Data Centre.

Table 6. Recorded occurrences of Red and Blue listed species and ecological communities within AOI boundary.

Common name	Scientific name	BC list status
Vertebrate animals		
American Badger	*Taxidea taxus*	Red
Gophersnake, deserticola subspecies	*Pituophis catenifer deserticola*	Blue
Grasshopper Sparrow	*Ammodramus savannarum*	Red
Great Basin Spadefoot	*Spea intermontana*	Blue
Great Blue Heron, Herodias subspecies	*Ardea Herodias Herodias*	Blue
North American Racer	*Coluber constrictor*	Blue
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	Blue
Swainson's Hawk	*Buteo swainsoni*	Red
Western Harvest Mouse	*Reithrodontomys megalotis*	Blue
Western rattlesnake	*Crotalus oreganus*	Blue
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	Blue
Vascular plants		
Mexican mosquito fern	*Azolla mexicana*	Blue
Ecological communities		
Baltic rush - common silverweed	*Juncus balticus - Potentilla anserina*	Blue
Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood	*Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus sericea*	Red
Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	Red
Common cattail Marsh	*Typha latifolia Marsh*	Blue
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus Deep Marsh*	Blue
Trembling aspen / common snowberry / Kentucky bluegrass	*Populus tremuloides / Symphoricarpos albus / Poa pratensis*	Red
Invertebrate animals		
Immaculate Green Hairstreak	*Callophrys affinis*	Blue
Nevada Skipper	*Hesperia nevada*	Blue
Rocky Mountain Ridged Mussel	*Gonidea angulate*	Red
Vivid Dancer	*Argia vivida*	Blue

4. WILDFIRE RISK ASSESSMENT

The wildfire risk assessment is a decision support tool intended to determine wildfire risk reduction activities and opportunities that will increase the City of Vernon's resiliency to wildfire.

It is important to understand the difference between **wildfire risk** and **wildfire threat**, and their context for the wildfire risk planning process. A wildfire risk-based framework considers the likelihood of an unwanted wildfire event, combined with the consequences to communities and high value resources and assets. Overall wildfire risk can be defined as a combination of the following:

- Likelihood (or probability) of an unwanted wildfire event occurring;
- Associated fire behaviour; and
- Consequence – the resulting impact or damage to values.

Wildfire risk is measured as the product of likelihood and consequence, but multiple inputs are also required to effectively quantify risk, including potential wildfire behaviour severity, value type, and value vulnerability. Identifying wildfire risk levels through the wildfire risk assessment results in a wildfire mitigation priority list, while presenting opportunities to enhance community resiliency.

Wildfire threat refers to the potential for a wildfire to ignite, spread, and consume organic material, such as trees, shrubs, and woody debris, across the landscape. Three main components are used to define wildfire threat, as follows:

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

Together these three components interact to characterize the overall wildfire environment and influence wildfire behavior (**Figure 5**).

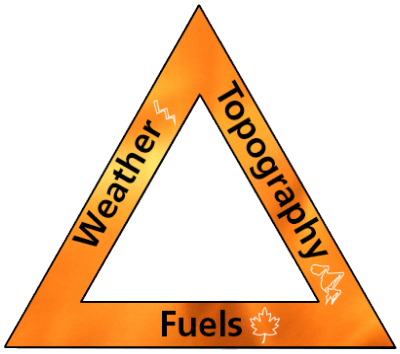

Figure 5. The fire triangle – interacting components that drive a wildfire.

4.1 WILDFIRE ENVIRONMENT

4.1.1 TOPOGRAPHY

The topography surrounding the City of Vernon is diverse (**Figure 6**). The population and infrastructure are located at the valley bottom, which is relatively flat, while rolling hills, grass benchlands and low mountain ridges characterize the surrounding area. The valley bottom is approximately 380 m above sea level. In contrast, the highest point within the city boundary is Predator Ridge Resort, which stands at an elevation of 652 m. Most valley-side hills have a western or southern aspect, and the vegetation is adapted to hot and dry conditions. The most challenging terrain is in the southwest and northeast, coinciding with the densest forest cover and overlapping with the WUI. The predominant wind direction tends to be from the southwest, as the valley and fetch of Okanagan Lake act as a funnel.

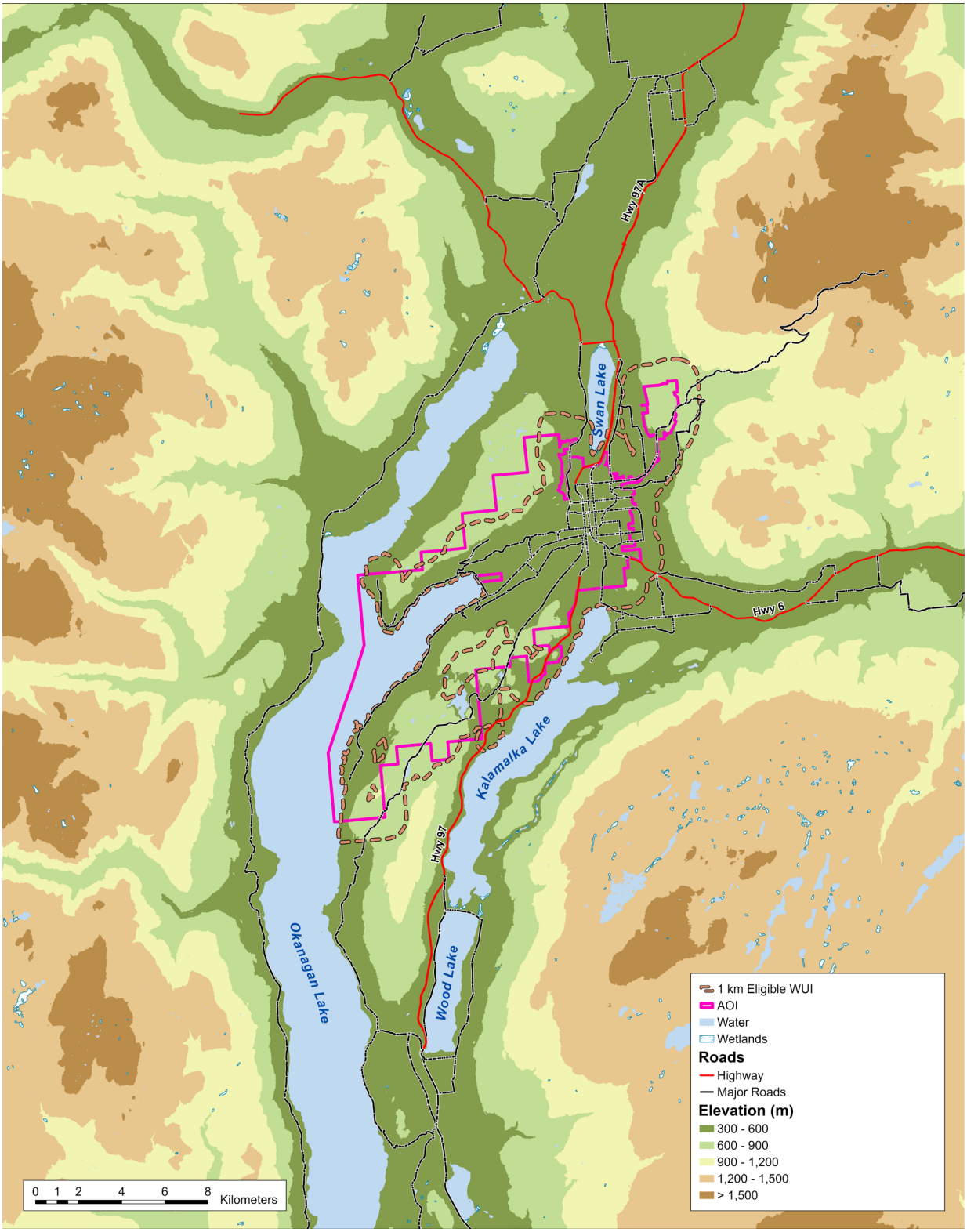

Figure 6. Elevation map of AOI and surrounding area.

4.1.2 BIOGEOCLIMATIC ZONES

The vegetation (fuels) within any given area of British Columbia can be summarized using the provincial Biogeoclimatic Ecosystem Classification (BEC) system. The BEC system in BC describes and categorizes ecological zones by vegetation, soils, and climate. Regional subzones are derived from relative precipitation and temperature. By understanding the vegetative communities of an area, we can better predict the natural disturbance regime of those ecosystems and the potential effects of wildfire (**Figure 7**).

Vernon is situated in the Interior Douglas-fir (IDF xh1) biogeoclimatic (BEC) zone. The IDFxh1 variant occupies lower elevations in the Okanagan Valley (400-1250 m). The zone is characterized by a warm, dry climatic regime with a relatively long growing season in which moisture deficits are common. In zonal sites, Douglas-fir (*Pseudotsuga menziesii)* is found in climax stands, commonly with an understory of pinegrass (*Calamagrostis rubescens*). In dry sites, mature climax stands of Douglas-fir form open forests, and a sparse shrubby understory exists with saskatoon (*Amelanchier alnifolia*), birch-leaved spirea (*Spirea betulifolia*) and blue bunch wheatgrass (*Agropyron spicatum*). Within a five-kilometer buffer surrounding the City of Vernon municipal boundary are several other biogeoclimatic zones, detailed below in **Table 7**.

Table 7. Biogeoclimatic zones, subzones and variants and their corresponding NDT ratings found within a five-kilometer buffer surrounding Vernon.

BGC Label	Zone	Subzone	Variant	NDT
IDF xh1	Interior Douglas-fir	Very Dry Hot	Okanagan	NDT4
IDF dm1	Interior Douglas-fir	Dry Mild	Kettle	NDT4
ICH xm1	Interior Cedar – Hemlock	Very Dry Mild	Shuswap	NDT4
ICH mk1	Interior Cedar – Hemlock	Moist Cool	Okanagan	NDT3

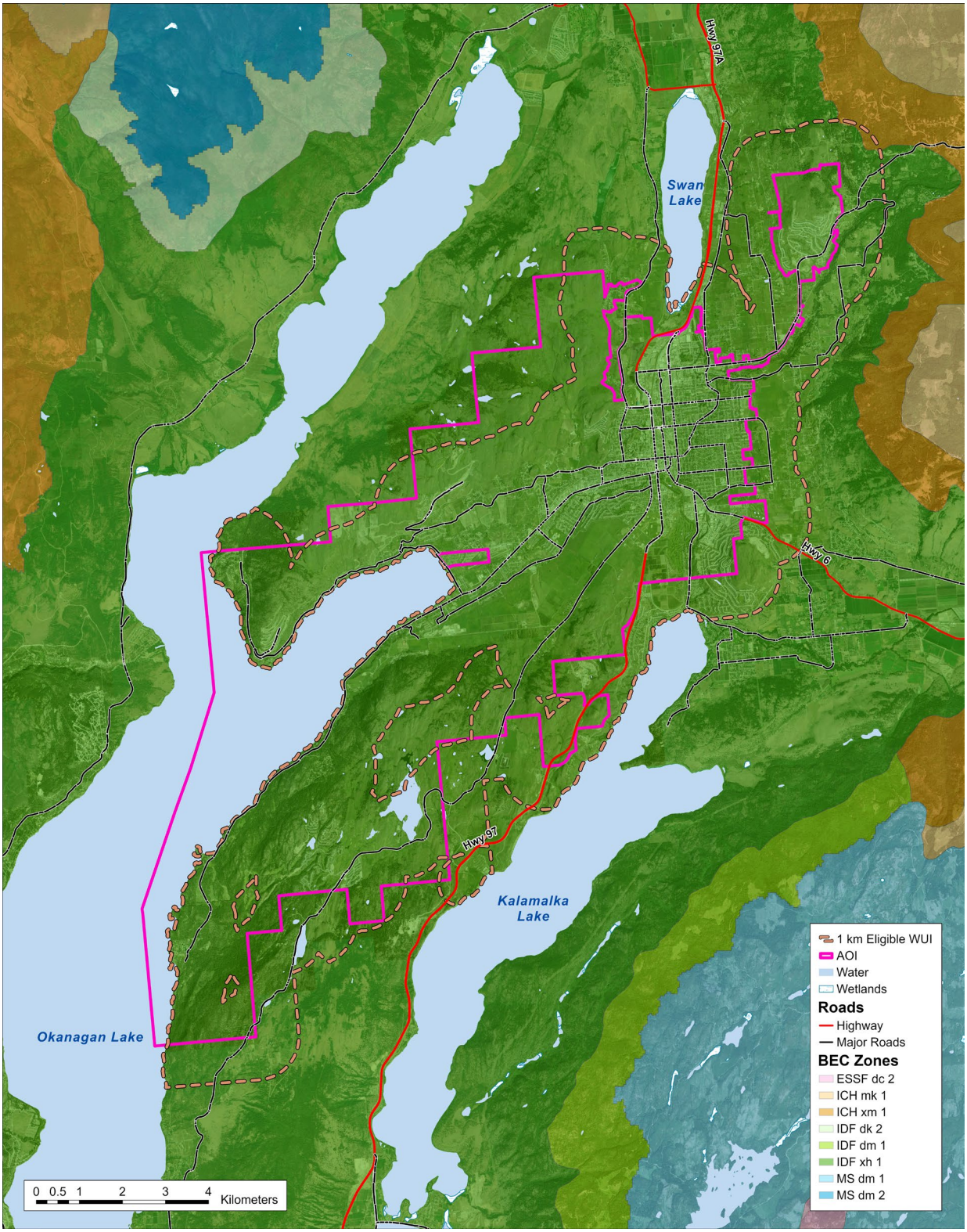

Figure 7. BEC zones of AOI and surrounding area.

4.1.3 NATURAL DISTURBANCE TYPES

In BC, fire regimes can be broadly characterized according to Natural Disturbance Type (NDT) classifications depending on disturbance frequency and severity[20]. The NDT classification scheme ranges from NDT1 to NDT5, as described in **Table 8**. Biogeoclimatic zones are also broadly characterized by an NDT classification. In the Vernon area, the Interior Douglas-fir BEC zone corresponds to an ecosystem with frequent *stand-maintaining* fires (NDT4). The distinction between stand-initiating and stand-maintaining relates directly to fire severity: a stand-initiating fire is generally high-intensity and lethal to majority of the forest stand, while a stand-maintaining fire is generally low-intensity and predominantly only fatal to seedlings and saplings, with larger fire-adapted conifers (e.g., Ponderosa Pine and Douglas-fir) surviving.

Table 8. *Natural disturbance type (NDT) classification used in BC.*

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

Regarding fire type and intensity, stand-maintaining events in NDT4 tend to be frequent low-intensity surface fires that keep ecosystems in a steady state. Before European colonization, cultural burning by First Nations maintained grassland communities, essentially limiting encroachment and establishment of most woody trees and shrubs. Depending on the ecosystem surface, fire intervals ranged from 4 to 50 years in the NDT4[21]. However, over 70 years of fire suppression and forest protection efforts have reduced the frequency of surface fires in NDT4, resulting in denser forest stands with understory fuel build-up. Consequently, stand-initiating events occur more often within NDT4 due to higher intensity fires that become crown fires in forests that frequent surface fires have not maintained. Before wildfire exclusion activities, destructive crown

[20] Biodiversity Guidebook. Forest Practices Code of British Columbia.
[21] Maintaining Fire in British Columbia Ecosystems: An Ecological Perspective. Erin Hall.

fires were seldom observed within the IDF, occurring every 150 to 250 years or more. This trend causes firefighting to be more dangerous and to require more suppression effort and cost. **Therefore, understanding and reducing the wildfire hazard is imperative within these NDT4 ecosystems.**

4.1.4 FUEL TYPES

The open forest and grassland ecosystems found within the City of Vernon contain a range of ecological diversity (**Figure 8**). Regarding the wildfire environment, vegetation is the primary fuel that sustains combustion and can ultimately be manipulated. In Canada, fuels are categorized into 16 fuel types within the Fire Behaviour Prediction (FBP) System as part of the Canadian Forest Fire Danger Rating System (CFFDRS)[22]. The FBP fuel types are broken into five prefixes, followed by a number further designating further categorization. The FBP fuel type categorization is presented in **Table 9**.

Table 9. FBP fuel type classification used in Canada.

FBP Fuel Type	Description
C1	Spruce-Lichen Woodland
C2	Boreal Spruce
C3	Mature Jack or Lodgepole Pine
C4	Immature Jack or Lodgepole Pine
C5	Red and White Pine
C6	Conifer Plantation
C7	Ponderosa Pine-Douglas-Fir
D1	Leadless Aspen
S1	Jack or Lodgepole Pine Slash
S2	White Spruce-Balsam Slash
S3	Costal Cedar-Hemlock-Douglas-Fir Slash
O1	Grass; further designation by ‘a’ -matted or ‘b’ - standing
M1	Boreal Mixedwood-Leafless

[22] Hirsch KG. 1996. Canadian forest fire behavior prediction (FBP) system: user's guide. Vancouver (BC): UBC Press.

FBP Fuel Type	Description
M2	Boreal Mixedwood-Green
M3	Dead Balsam Fir Mixedwood-Leafless
M4	Dead Balsam Fir Mixedwood-Green

Due to the high variation of forest ecosystems in BC, FBP fuel types are not based on vegetation types specifically, but predominantly based on components of stand structure and composition, forest floor, organic layer, surface fuels, and ladder fuels. The province classifies the land base according to fuel type through a GIS process that looks at vegetation inventories. Areas that lack vegetation (e.g., urban areas, roads, gravel pits etc.) are classified as *non-fuel*. Waterbodies are classified as *water*.

For the City of Vernon's CWRP, an analysis of the provincial fuel layer was conducted for two areas: within the municipal boundary (**Table 10**) and within a 5 km buffer around the municipal boundary (**Table 11**). The results indicate that approximately 50% of the area within the municipal boundary is classified as non-fuel (urban area or water). Specifically, 36.1% of the area is characterized as grass fuel type, followed by 31.8% as non-fuel, representing Vernon's urban low-elevation areas (**Table 10**).

The BC Wildfire Service (BCWS) has classified fuel types based on their relative crown fire and spotting potential. This classification system describes how easily a specific fuel type can transition from a surface fire (burning on the forest floor without involving the tree canopy) to a crown fire (burning both surface and canopy fuels) and produce embers and firebrands that can be carried by the wind and ignite spot fires. For example, the C-7 fuel type demonstrates a moderate crown fire and spotting potential, while the O-1 grass fuel type has a low potential due to the lack of conifer trees present.

Within the municipal boundary, approximately 14% of the area exhibits the potential for moderate crown fire and spotting, primarily represented by the C-7 Ponderosa Pine and Douglas-fir fuel type.

Table 10. Fuel type classification by area within the City of Vernon.

Fuel Type	Area (ha)	%	Crown Fire & Spotting Potential
O-1a/b – Grass	4,205.16	36.1%	Low
N – Non-fuel	3,710.92	31.8%	Nil
W – Water	2,078.19	17.8%	Nil
C-7 – Ponderosa Pine – Douglas-fir	1,599.26	13.7%	Moderate
C-3 – Mature Jack or Lodgepole Pine	36.89	0.3%	Moderate
M-1/2 – Boreal Mixedwood	20.12	0.2%	Moderate
D-1/2 -Leafless/Green Aspen	12.36	0.1%	Very Low
Total	**11,662.90**	**100.0%**	

A five-kilometer buffer was created around the municipal boundary to assess fuel types in the broader Vernon area, and the provincial fuel layer was clipped accordingly (**Table 11**). Within this expanded area, encompassing approximately 51,718 hectares, the three predominant fuel types—non-fuel, grass, and water—comprise about 73% of the total area. The C-7 fuel type represents around 19% of the area and is associated with a moderate crown fire and spotting potential.

Table 11. Fuel type classification by area within five kilometers of the Vernon municipal boundary.

Fuel Type	Area (ha)	%	Crown Fire & Spotting Potential
N – Non Fuel	13,668.40	26.43%	Nil
O-1a/b – Grass	13,206.48	25.54%	Low
W – Water	11,604.04	22.44%	Nil
C-7 Ponderosa Pine – Douglas-fir	9,676.15	18.71%	Moderate
C-5 – Red and White Pine	1,246.18	2.41%	Low
M-1/2 – Boreal Mixedwood	979.12	1.89%	Moderate
C-3 – Mature Jack or Lodgepole Pine	689.51	1.33%	Moderate
D-1/2 – Leafless/Green Aspen	588.11	1.14%	Very Low
C-6 – Conifer Plantation	60.02	0.12%	Low
C-2 – Boreal Spruce	0.50	0.00%	High
Total	**51,718.51**	**100.0%**	

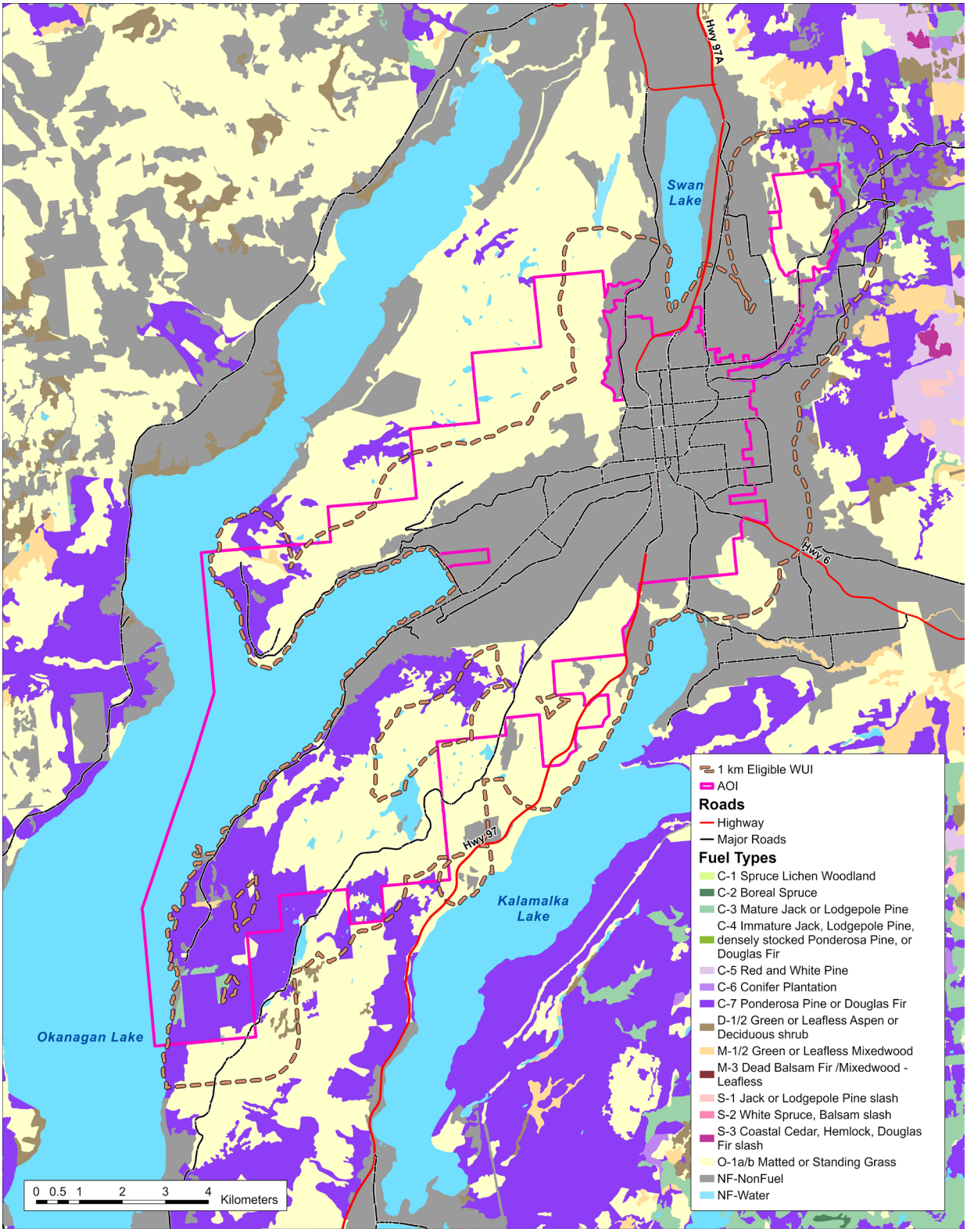

Figure 8. Fuel types in the AOI and surrounding area.

4.1.5 WEATHER

Weather attributes including temperature, relative humidity, precipitation, wind speed and wind direction are critical factors in the ignition, spread, and duration of wildfires. Weather is the most variable component of the wildfire environment, and it has a direct relationship to fuel moisture, which is a crucial determinant of combustibility. Local difference in aspect, topography and vegetation will also influence fuel-moisture at the site level. There are five BCWS fire weather stations in the region surrounding the City of Vernon; the closest being the Fintry station located west of the City of Vernon along the northside of Okanagan Lake (**Table 12**).

Table 12. BCWS fire weather station details for stations near the City of Vernon.

BCWS Fire Weather Station	Station Code	Distance from City of Vernon Boundary	Station Elevation	Latitude	Longitude	Install year
Fintry	298	3.4 km	670	50.206667	-119.48	1990
West Kelowna	40	31 km	650	49.8832	-119.5695	2016
Mable Lake	362	31 km	548	50.351667	-118.773333	1987
Station Bay	49	34 km	1100	50.497222	-119.726944	2019
Kettle	388	56 km	1389	49.959983	-118.626033	1987

Using the Fintry weather station and focusing on the period from May to September, which encompasses a typical fire season, the prevailing wind direction is primarily from the south and southeast (**Figure 9**). However, it is crucial to also consider diurnal wind shifts influenced by local topographic features. During the daytime hours of the month of August (06:00 – 18:00), winds predominantly blow from the south and southeast, while nighttime winds (18:00 – 06:00) are from the northwest.

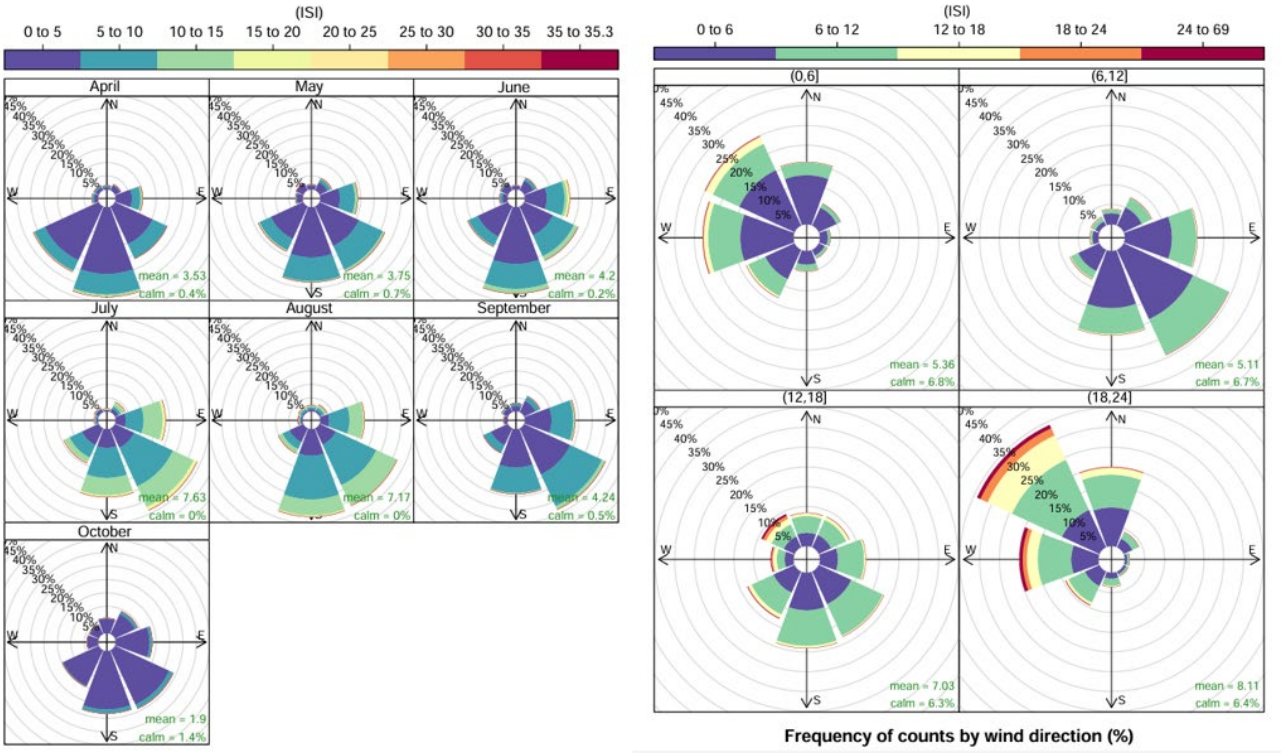

Figure 9. Initial Spread Index (ISI) Rose for the Fintry weather station observations between 1996 – 2015. Monthly averages (left), and August hourly averages (right). Hourly averages are binned into periods of six hours (00:00-06:00, 06:00-12:00, 12:00-18:00, 18:00-24:00).

Diurnal wind effects along Okanagan Lake significantly influence fire behaviour and have contributed to devastating fire impacts in the Okanagan Valley, as discussed in Section 10, Emergency Planning. The temperature difference between the land and water primarily influences these wind effects. During the day, the land heats up more quickly than water due to differences in specific heat capacity, causing warm air to rise over the land, creating a low-pressure area. As a result, cooler air from the lake moves in to fill this void. Conversely, at night, the land cools down more rapidly, causing the air above it to be cooler and denser, leading to a high-pressure area over the land. Along Okanagan Lake, this phenomenon causes dense cool air from the plateau to flow downwards towards the lake. Regarding fire behaviour, during nighttime diurnal wind patterns, fires tend to grow downhill from forested areas along the plateau towards human settlements along Okanagan Lake, as seen in the 2023 McDougall Creek Fire, 2021 White Rock Lake Fire, and 2014 Terrace Mountain Fire.

4.1.6 CLIMATE CHANGE

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

- Increased disturbances due to insects and disease
- Northerly and upslope migration of tree species' ranges
- Increased wildfire severity
- Longer wildfire seasons
- Increased number of high and extreme fire danger days for an average year

These climate-induced effects are in addition to the negative effects of fire exclusion from otherwise fire-maintained ecosystems, leading to higher stand densities and increased fuel buildup that are subjected to longer periods of hotter and drier summer weather.

The regional climate service center for the Pacific and Yukon Regions, located at the University of Victoria, is called the Pacific Climate Impacts Consortium (PCIC). This non-profit corporation conducts quantitative studies on the impacts of climate change and climate variability[23]. Findings from these studies are incorporated into practical tools for end-user application. For example, the PCIC website offers a map-based data portal for downloading information, analysis tools for the various regions in BC (Plan2Adapt, Climate Explorer, and seasonal anomaly maps), downloadable publications, and software for climate data interpretation.

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

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

Climate change has already begun impacting Vernon, with the community experiencing climate-related disasters such as floods, landslides, and wildfires from 2017 to 2019. These events incurred substantial costs for emergency creek works and services for wildfire evacuees, amounting to approximately $775,000 for the city. Additionally, there has been a decline in tourist numbers, potentially linked to the adverse effects of climate change. For instance, visitor centre attendance decreased by more than a third, from 17,365 in 2016 to 10,860 in 2018, coinciding with periods of heavy wildfire smoke[24].

[23] Pacific Climate Impacts Consortium. 2023
[24] Vernon Climate Action Plan. 2021.

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

A summary of projected changes in average temperature and precipitation for the North Okanagan is provided in **Table 13**. This illustrates the likely increase in annual temperature (+3.2 °C), with less precipitation in summer (-7.7%), and more in winter (+3.5%)[25].

Table 13. Summary of projected changes in average (mean) temperature and precipitation in the North Okanagan region from the historical baseline (1961 – 1990) to the 2050s (2040 – 2069).

Climate Variable	Season	Projected change from historical baseline (1961-1990) to the 2050s for the North Okanagan region	
		Ensemble Median*	Range^ (10th to 90th percentile)
Temperature (°C)	Annual	+3.2 °C	+2.1 °C to +4.2 °C
Precipitation (%)	Annual	+0.13%	-2.1% to +7.2%
	Summer	-7.7%	-33% to +0.81%
	Winter	+3.5%	-1.1% to +8.3%

***The ensemble median is a mid-point value, chosen from a PCIC standard set of Global Climate Model (GCM) projections.**

^The range values represent the lowest and highest results within the set.

[25] Pacific Climate Impacts Consortium. 2023.

4.2 LOCAL WILDFIRE HISTORY

Fire history tells the story of the relationships between fire behavior, landscape ecology, management policy (including fire suppression), human development, and other land-use changes throughout the area. The potential for large, destructive, and landscape-altering fires is related to historical fire characteristics and fire response patterns within a given planning unit. Although the location of future ignitions is challenging to predict, a review of historical fire ignitions and spread can reveal patterns that are more likely to occur in the future.

Historical fire history data for the Vernon area was acquired from the BC Data Catalogue. The fire history analysis for this CWRP utilized point data spanning from 1950 to 2022 and polygon data representing fire perimeters from 1919 to 2022 (**Figure 10**). Before 1950, polygon data was limited to fires with large perimeters. In addition, the collection of point data was limited to the City of Vernon municipal boundary and a five km buffer surrounding it. The inclusion of the buffer aimed to account for fires originating in the outskirts of the city boundary but possessing the potential to pose a threat to the city itself, as observed in the case of the White Rock Lake wildfire in 2021.

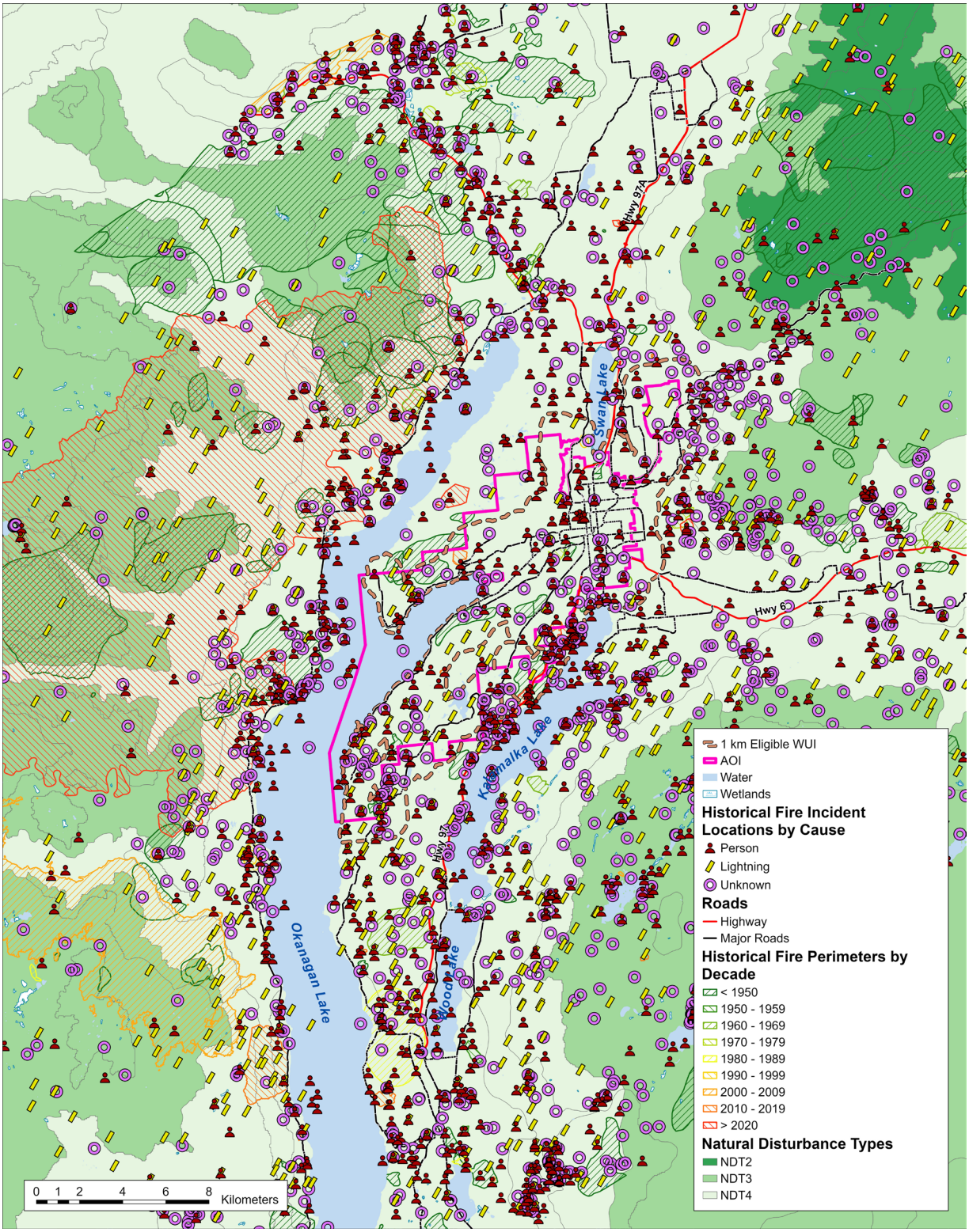

Figure 10. Fire occurrence history for the AOI and surrounding area.

The fire history dataset provides a general sense of historical trends in an area. As seen in **Table 14**, most wildfires since 1950 were human caused at 76%. This finding aligns with the concentration of recreational, agriculture, and general human activities within the area.

Table 14. Historical wildfires within the City of Vernon and including a five km buffer surrounding the municipal boundary. Fire types other than "wildfire" (e.g., nuisance, smoke chase etc.) have been filtered out of the analysis.

	Wildfire Cause			
	Lightning	**Person**	**Unknown**	**All**
Total wildfires (1950-2022)	174	596	12	782
% of all wildfires	22%	76%	2 %	100%
Annual Average	2	8	NA	11
Max number of wildfires in one season	12	32	NA	38
Year(s) of maximum	1994	1970	NA	1970

The total burned area between 1950 and 2021 was 1,207 ha as seen in **Table 15**. Of this, the human-caused fires contributed more to the total burnt area. The 2021 fire season saw the most extensive area burnt. Notable fires from that season included the Becker Lake Fire (K41727) reported on July 10th, which grew to 34 hectares and caused an evacuation alert affecting several hundred homes. A second fire also discovered on July 10th along Clerke Rd (K41708) grew to 43 hectares and forced a tactical evacuation for nearby residents and evacuation alerts for the Commonage Road area. The fire also caused the closure of Highway 97, a major transportation corridor in the Okanagan.

Table 15. Historical area burned within 5km of the City of Vernon municipal boundary between 1950 and 2021 due to wildfires.

	Wildfire Cause			
	Lightning	**Person**	**Unknown**	**All**
Total Area Burnt (ha)	178	1,023	6	1,207
% of all wildfires	15%	89%	NA	100%
Max number of ha burnt in one season	129	179	NA	180
Year(s) of maximum	1998	2021	NA	2021

Annual wildfire occurrence within the fire history area has also been graphed (**Figure 11**) to illustrate the linear trends of lightning and person-caused wildfires between 1950 and 2022. Notable is the

decreasing linear trend of person-caused wildfires over the past 72 years. This trend is likely attributable to several factors, including improved fire prevention technologies (e.g., spark arrestors), public education, and fire prevention regulations. The linear trend for annual lightning-caused wildfires is virtually flat over the same period.

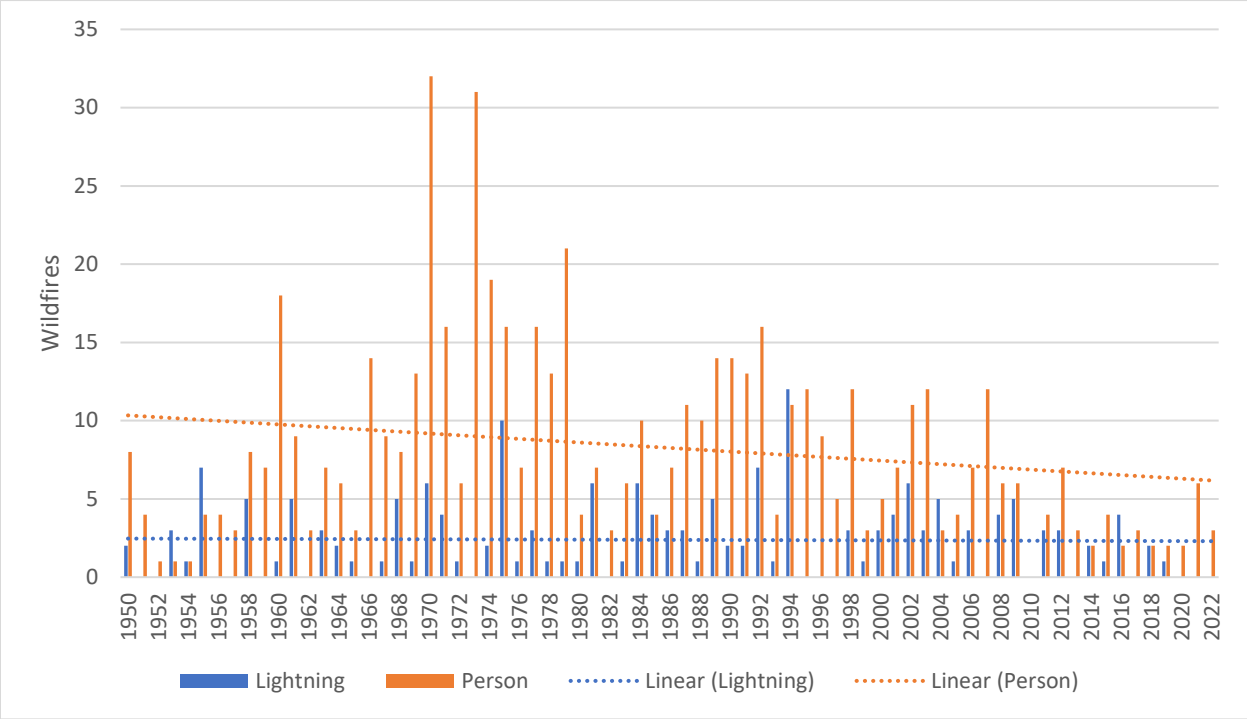

Figure 11. Annual wildfire occurrence within five km of the City of Vernon boundary, from 1950 to 2022.

The annual total area burned has been graphed (**Figure 12**) for the fire history area from 1950 to 2021. A recent trend in the BC Interior are the spikes in annual area burned stemming from recent severe fire seasons. The general overall trend shows the extremes in total area burned has been increasing over the decades.

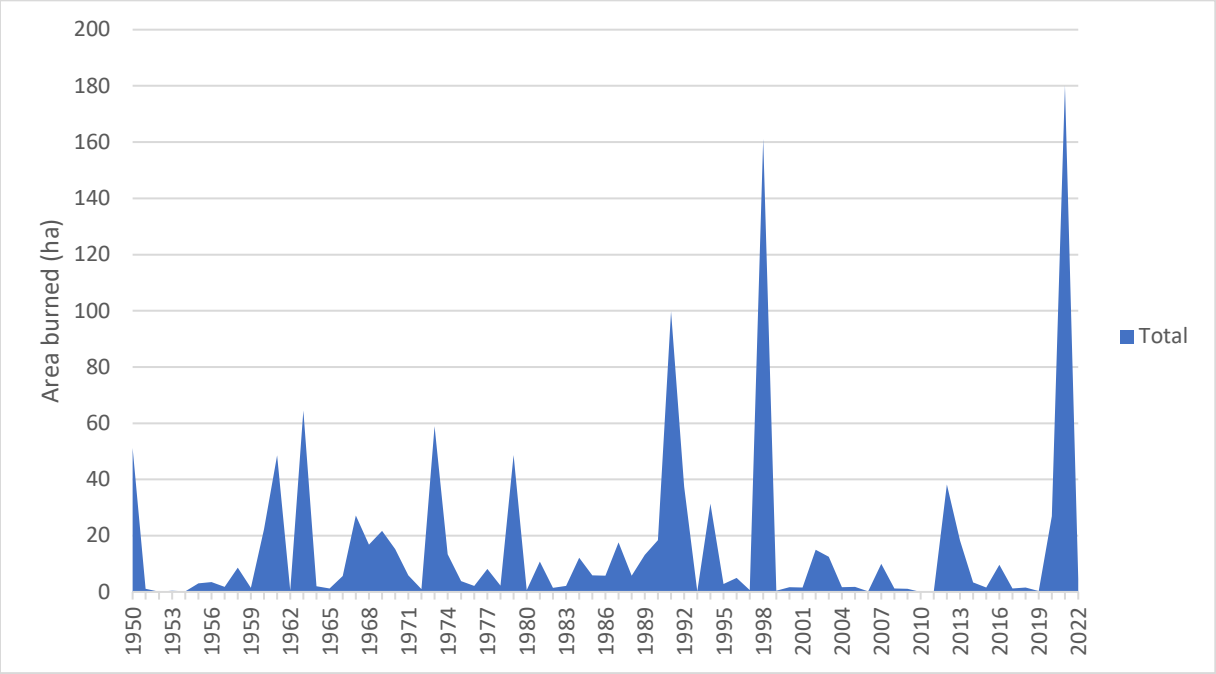

Figure 12. Annual area burned within the five km of the City of Vernon boundary, from 1950 to 2021.

4.3 PROVINCIAL STRATEGIC THREAT ANALYSIS (PSTA)

The Provincial Strategic Threat Analysis (PSTA) and Risk Class framework are provincial spatial datasets developed by the BC Wildfire Service to assess and predict potential wildfire threat (**Figure 13**). The PSTA utilizes and interprets provincial fuel type mapping, historical fire occurrence data, topography, and historical weather station data to produce a wildfire threat score. Outputs of the PSTA include information and maps describing fuel types, historical fire density, potential for embers to land in an area (spotting impact), head fire intensity, and the final wildfire threat. Details regarding how the PSTA dataset was derived can be found through the BCWS, and BC Data Catalogue websites[26] [27].

[26] Fire and Fuel Management. Province of BC.
[27] BC Data Catalogue. Province of BC.

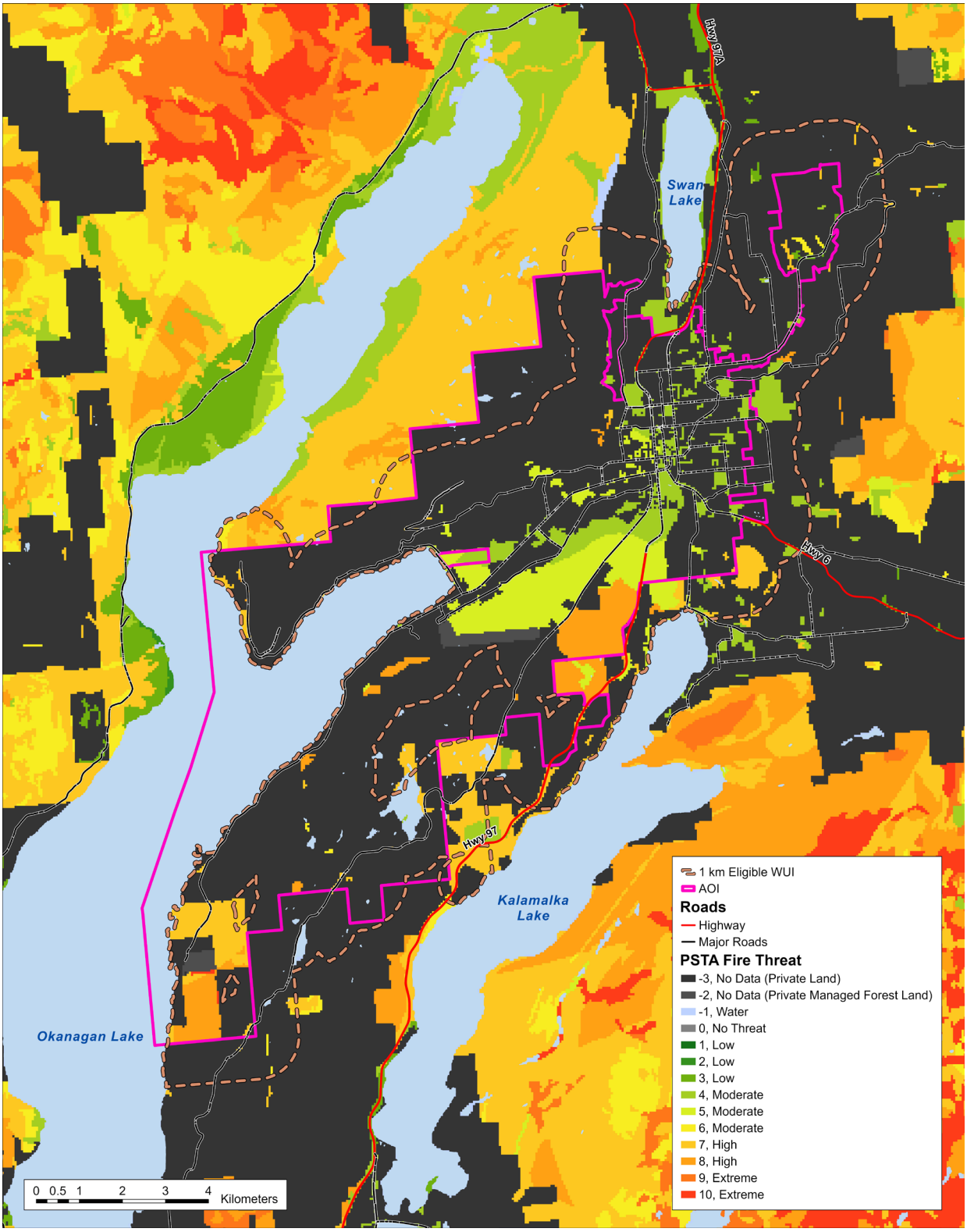

Figure 13. PSTA of the AOI and surrounding area.

Wildfire threat is directly related to the likelihood of hazardous fuel igniting (fire history factors) and wildfire spreading directly into the community (head fire intensity) or through ember transport (spotting impact). The PSTA wildfire threat ratings for the City of Vernon municipal boundary (**Table 16**) and a five-kilometer buffer area (**Table 17**) were analyzed. It is important to note that a significant limitation of the PSTA datasets is that the ratings are limited to public land, with private land classified as *No Data.* Consequently, the *No Data* classification accounts for approximately 65% of the area within the municipality and 44% of the larger five-kilometer buffered area.

As discussed previously, it is worth mentioning that over a quarter of the municipality is classified as *Non-fuel,* which would preclude any PSTA determinations as the methodology relies on inputs from the FBP system and its fuel types. Additionally, it is understandable that the provincial government is hesitant to make blanket determinations of wildfire threat over private property due to liability and property insurance concerns.

Table 16. PSTA threat rating by categories by area inside the Vernon municipal boundary.

PSTA Threat Code	Area (ha)	%
No Data (Private Land)	7,571.72	64.9%
Water	2,080.30	17.8%
Moderate	1,172.21	10.1%
High	718.17	6.2%
No Data (Private Managed Forest Land)	104.50	0.9%
Low	11.00	0.1%
Extreme	5.00	0.0%
Total	**11,662.90**	**100%**

Table 17. PSTA threat rating by categories by area within five kilometers and including the Vernon Municipal boundary.

PSTA Threat Rating	Area (ha)	%
No Data (Private Land)	22,982.02	44.4%
Water	11,644.81	22.5%
High	10,984.45	21.2%
Moderate	4,287.64	8.3%
Low	1,129.58	2.2%
Extreme	488.98	0.9%
No Data (Private Managed Forest Land)	201.00	0.4%
Total	**51,718.49**	**100.0%**

Used as a gauge to estimate the difficulty of controlling a fire, head fire intensity (HFI) is the predicted energy of a fire along the front or head of the fire and is measured in kilowatts per meter[28]. Head fire intensity is calculated from the predicted rate of spread (ROS) and total fuel consumption of a particular fuel type. For the PSTA, HFI is calculated based on the FBP-predicted fire behavior for a particular area, using the fuel type, topography, and 90th percentile fire weather conditions, and then categorized into one of 10 HFI classes. Private land and water are assigned their own classifications (**Table 18**).

Table 18. PSTA head fire intensity (HFI) categories by area inside Vernon municipal boundary.

HFI Category	Area (ha)	%
No Data (Private Land)	7,563.93	64.85%
Water	2,080.05	17.83%
Non-Fuel	1,175.71	10.08%
>4000 to 6000 kW/m	394.10	3.38%
>2000 to 4000 kW/m	338.36	2.90%
No Data (Private Managed Forest Land)	104.50	0.90%
>18000 to 30000 kW/m	5.00	0.04%
>0 to 1000 kW/m	1.25	0.01%
Total	**11,662.90**	**100.00%**

[28] CWFIS Datamart. Natural Resources Canada.

As with the PSTA threat rating, the PSTA HFI layer has been clipped to both the Vernon municipal boundary (**Table 18**) and a five-kilometer buffered area around the boundary (**Table 19**). The classified HFI areas of No Data are similar to those of the PSTA threat ratings.

Table 19. PSTA head fire intensity (HFI) categories by area within five kilometers of the Vernon municipal boundary.

HFI Category	Area (ha)	%
No Data (Private Land)	22,956.27	44.4%
Water	11,640.57	22.5%
>4000 to 6000 kW/m	6,696.57	12.9%
>2000 to 4000 kW/m	5,379.92	10.4%
Non-Fuel	3,555.41	6.9%
>0 to 1000 kW/m	449.88	0.9%
>10000 to 18000 kW/m	391.14	0.8%
>6000 to 10000 kW/m	289.61	0.6%
No Data (Private Managed Forest Land)	201.00	0.4%
>18000 to 30000 kW/m	146.40	0.3%
>30000 to 60000 kW/m	11.75	0.0%
Total	**51,718.51**	**100.0%**

To aid the interpretation of the HFI summaries, a table cross-referencing the PSTA HFI classes with the FBP System intensity classes is provided in **Table 20**, including corresponding fire behavior descriptions. In addition, the commonly used threshold of ground firefighter effectiveness and safety with hand tools, pumps and hoses is also depicted in **Table 20**. The 2,000 kW/m HFI threshold is a common rule of thumb for the upper limit of firefighter effectiveness and safety[29]. Beyond this threshold, firefighting actions at the head of fire become increasingly ineffective and confined to heavy equipment and aircraft, indirect attack, limited actions to the flanks and back etc. Any firefighting actions when fire intensity >10,000 kW/m are generally considered extremely difficult and hazardous, requiring disengagement or, at most, executing highly planned and prepared indirect contingency tactics.

[29] Predicting fire beahviour in black spruce-lichen woodland fuel type in western and northern Canada. Northern Forestry Centre. 1989.

Table 20. Comparison of the FBP System intensity classes and HFI ranges to the British Columbia PSTA HFI class ranges.

BC PSTA Head Fire Intensity (HFI)		CFFDRS Fire Behaviour Prediction System		
HFI Class	HFI Class range	Intensity class	HFI (kW/m)	Fire behaviour description
1	>0 to 1,000	1	<10	Smouldering ground or creeping surface fire. Little visible. Firebrands and active fires tend to be self-extinguishing except with high DC and/or BUI.
		2	10 to 500	Low vigor surface fire. In stands with low CBH, some foliage of individual trees consumed.
		3	500 to 2,000	Moderately vigorous surface fire with both low and high flames. Ladder fuels (lichen and bark flakes) consumed. Isolated torching in stands with low CBH or ladder fuels.
2	>1,000 to 2,000			
Commonly accepted HFI threshold for ground firefighter (with hand tools, pumps and hose) effectiveness and safety (Alexander & Lanoville, 1989) (Alexander & de Groot, 1988) (Andrews & Rothermel, 1982).				
3	>2,000 to 4,000	4	2,000 to 4,000	Highly vigorous surface fire with moderate to high flames. Passive crowning (isolated to abundant torching) increasing with amount of ladder fuels and low CBH.
4	>4,000 to 6,000	5	4,000 to 10,000	Extremely vigorous surface fire or active crown fire with abundant torching and continuous crowning in dense stands. Flames extend from the forest floor to above the tree canopy. Short to medium range spotting likely.
5	>6,000 to 10,000			
6	>10,000 to 18,000	6	>10,000	Blow-up or conflagration type fire runs. Continuous crowning in forester fuel types. Great walls of flame. Towering convection columns. Medium to long-range spotting. Fire whirls.
7	>18,000 to 30,000			
8	>30,000 to 60,000			
9	>60,000 to 100,000			
10	>100,000			

4.4 HAZARD, RISKS AND VULNERABILITY ASSESSMENT (HRVA)

A Hazard, Risk and Vulnerability Assessment (HRVA) is available in the *City of Vernon Emergency Management Plan (2022)*. The assessment identifies wildfire as frequent or very likely (**Figure 14**).

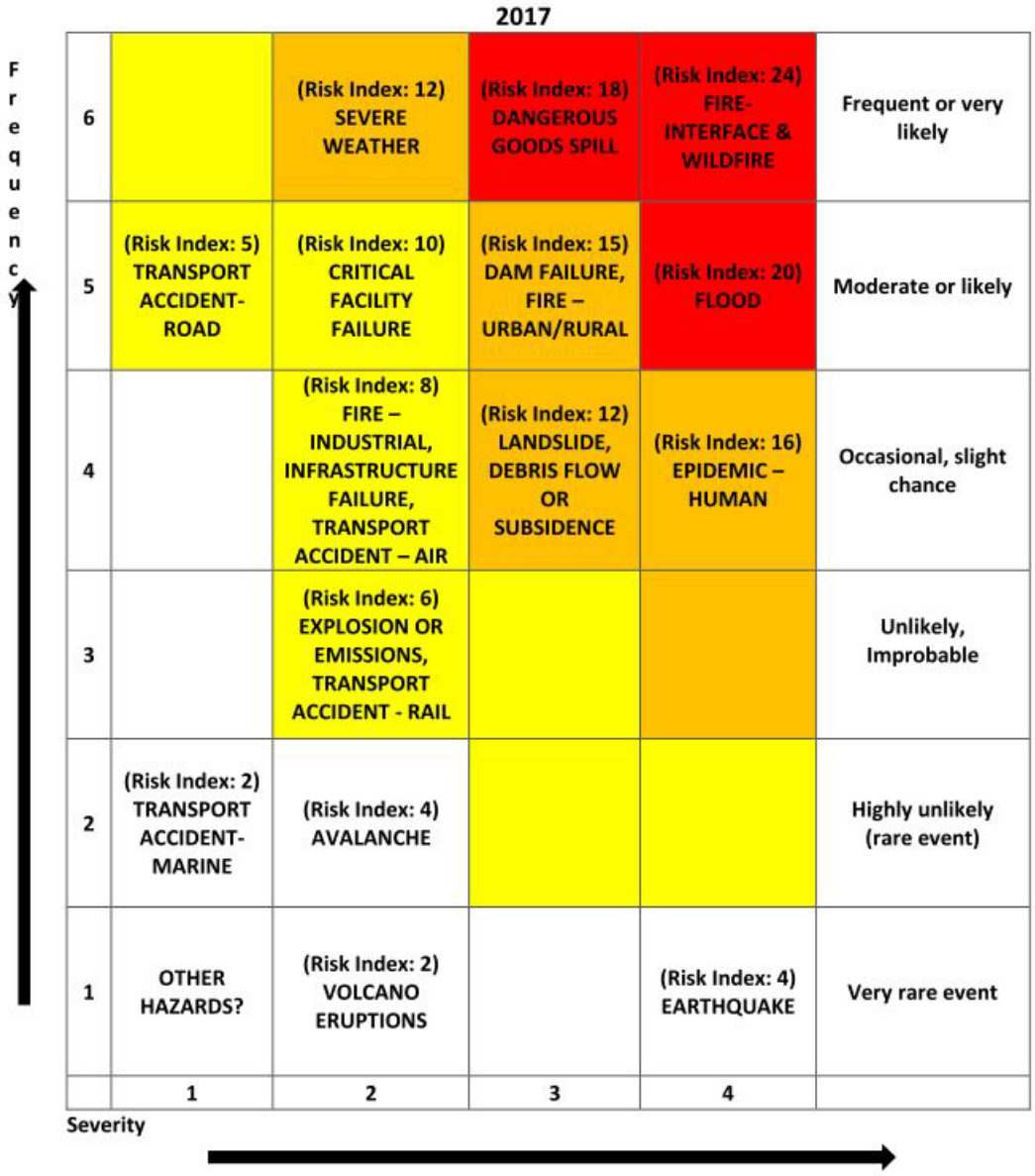

Figure 14. Hazard, Risk and Vulnerability Assessment.

4.5 LOCAL WILDFIRE THREAT ASSESSMENT

Part of the process of developing this CWRP involved on-the-ground verification and assessment of local vegetation types and the inherent wildfire threat of forested areas within and around communities. The local wildfire threat assessment for the Vernon area was conducted using the 2020 Wildfire Threat Assessment Guide and Worksheets from BCWS, which focuses on forest stand attributes and fuel structure, independent of fire weather and other fire behaviour components which are contained in the PSTA data[30]. The assessment process involved targeting areas mapped as having potentially threatening fuel types and completing threat assessment worksheets and fieldwork photographs. The results of the assessment are available in *Appendix C – Wildfire Threat Assessments*.

Overall, the wildfire threat assessment revealed moderate or low scores for the surveyed areas. However, it is crucial to note that these assessments do not consider the proximity to valuable assets or the potential consequences of wildfire damage to those assets. Additionally, the surveyed areas were limited to Crown or municipal land; thus, private land was not considered.

The assessments also identified modifications in stand characteristics, such as surface fuels and crown base heights, resulting from fuel treatments. For instance, certain areas visited for threat assessments had already undergone treatment, as seen in Ellison Park and Sunset Properties. These findings indicate that the City of Vernon has proactively implemented fuel management treatment in eligible areas.

[30] Wildfire Threat Assessment Material. Tools for Fuel Management.

5. EDUCATION

Public education and outreach efforts help community members learn about wildfire and its potential impacts to their communities. In addition, these efforts should be designed to help individuals understand their role in acting to reduce risk. Education and outreach activities are designed for all groups to benefit, including elected officials, community planners, residents, visitors, businesses, land managers, first responders, and more.

As of 2021, the Canadian Interagency Forest Fire Centre (CIFFC) became the owner and administrator of the FireSmart Canada program[31]. Partners in Protection, a national non-profit association comprised of national, provincial, and local government agencies with fire protection mandates, created the FireSmart brand in 1999, and ran the program for over 20 years. Modelled after the FireWise Communities USA program in the United States, FireSmart Canada has developed a comprehensive planning and assessment process to mitigate wildfire hazards from existing communities, as well as guide new development. Although the FireSmart program is primarily focused on residential homes, principles have been adapted for application in mixed-use areas, industrial activities, and elsewhere. For this reason, the terminology for structure or building are just as appropriate and applicable as home, house, or dwelling when referring to FireSmart principles.

5.1 FIRESMART GOALS AND OBJECTIVES

FireSmart Canada has two key goals:

1. "Improve communication with stakeholders; and …
2. Organize programs and assets into a logical, manageable structure based on three pillars – homeowners, neighborhoods, and communities".

Generally, FireSmart aims to encourage communities and citizens to adopt and conduct FireSmart practices to help mitigate negative impacts of wildfire to assets on public and private property. Findings from a study of the 2016 Horse River wildfire in Fort McMurray indicate that adherence to FireSmart principles was one of the main reasons why individual homes survived, regardless of the broader wildfire threat surrounding them – true in both the urban and rural areas[32].

[31] FireSmart Canada.
[32] Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster. Institute for Catastrophic Loss Reduction.

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

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

FireSmart describes three Priority Zones around a building, collectively named the Home Ignition Zone (**Figure 15**) alongside descriptions of what these zones should look like, starting from the edge of a building and moving outwards[33].

- Immediate Zone (0 – 1.5 m) Non-combustible surface should extend around the entire home and any attachments, such as decks.
- Intermediate Zone (1.5 – 10 m) This should be a fire-resistant area, free of all materials that could easily ignite from a wildland fire.
- Extended Zone (10 – 30 m) Thinned and pruned coniferous trees, alongside routine dead surface fuel cleanup.

[33] The Home Ignition Zone. FireSmart Canada.

Figure 15. FireSmart Home Ignition Zone, which is comprised of four priority zones, as illustrated in the BC FireSmart Begins at Home Manual.

Of particular importance are neighborhoods where homes and buildings are situated close together in a relatively higher density than more rural areas. This means that FireSmart Priority Zones frequently overlap with one another (i.e., Immediate Zone or Intermediate Zone from one building may encroach into an adjacent building's Zone Immediate or Intermediate). This highlights the importance of community resilience towards wildfire though working together to reduce wildfire hazard, especially within the WUI. The City of Vernon encompasses diverse property sizes reflecting the mix of urban, suburban, and rural areas within its boundary. Property sizes vary significantly depending on the specific location and zoning regulations. Within the urban core of Vernon, property sizes typically are of smaller residential-sized lots and have FireSmart Zone overlap. However, in the periphery of the city boundary, properties tend to be larger, especially in the Okanagan Landing, Adventure Bay, Foothills and Eastside Road areas which back into the outskirts of the WUI.

5.2 KEY ASPECTS OF FIRESMART EDUCATION FOR LOCAL GOVERNMENTS

Successful FireSmart communities depend on interested and proactive individuals who understand the risk of living in a wildfire prone environment. Local governments have limited ability to force residents to apply FireSmart principles to their private properties. However, local governments may promote FireSmart to residents through public education and awareness campaigns, which aim to encourage people to reduce the ignitability of their homes.

Private Land

Mitigation actions like landscape and community interface fuel treatments are most effective with site-specific FireSmart actions surrounding structures. As 88% of land located within the City of Vernon municipal boundary is private, this reduces the opportunities for CRI or Crown Land Wildfire Risk Reduction fuel treatments – placing greater importance on the role of private property owners to act to mitigate hazardous fuels that may threaten their homes and others surrounding it. In addition, home ignitibility in the WUI is more closely tied to the immediate areas surrounding homes and buildings than to large-scale wildfire management and fuel modification treatments[34]. Therefore, the City of Vernon should significantly focus on FireSmart education and outreach efforts over the limited opportunities for CRI fuel management treatments.

Current Status and Action Planning

FireSmart Recognized Neighborhoods generally contain 20-50 properties but could fluctuate depending on recommendations from the Local FireSmart Coordinator. Vernon has been successful in getting seven neighborhoods recognized by FireSmart BC through the FireSmart Neighborhood Recognition Program (FCNRO)[35]. **Table 21** shows the following neighborhoods that have demonstrated the necessary steps and measures to build wildfire resilient neighborhoods and neighborhoods in the process of working towards recognition.

Table 21. FireSmart neighborhoods recognized within the City of Vernon.

Neighbourhood	Status
Predator Ridge	Recognized
Sunset Properties	Recognized
Westerra Strata	Recognized
Adventure Bay	Recognized

[34] Preventing disaster: Home ignitability in the wildland-urban interface. Journal of Forestry. 2000.
[35] FireSmart Canada Neighborhood Recognition Program.

Neighbourhood	Status
Canadian Lakeview Estates	Recognized
Phoenix Estates	Previously Recognized (2021)
Kestral Estates	Previously Recognized (2021)
Sandpiper Estates	Process of Being Recognized (2023)
Infinity Strata	Process of Being Recognized (2023)
Outback Resort	Process of Being Recognized (2023)
Inglewood Strata	Process of Being Recognized (2024)
Landsdown	Process of Being Recognized (2024)
Summerwinds	Process of Being Recognized (2024)

The full suite of CRI FireSmart activities eligible for funding represents a significant workload for most local governments to coordinate. As BCWS has become more invested in FireSmart, more emphasis has been placed on regional government coordination of FireSmart activities, which has resulted in a recent trend of reducing the role of FireSmart consultants in favor of providing local governments funding to hire their own FireSmart coordinators. Since 2021, the City of Vernon has employed a full-time FireSmart Coordinator. The coordinator is responsible for facilitating FireSmart-related activities within the City of Vernon and ensures FireSmart activities are supported, developed, and implemented in accordance with Provincial guidelines and with the direction and policy provided by the City of Vernon.

This CWRP will only be successful if enough of community members are engaged, informed, and supportive of FireSmart. Implementing specific activities identified within this CWRP is dependent on educating the community about the reasons for, and benefits of, certain mitigation activities.

The following are recommended action items regarding FireSmart education:

Action #1: Update and maintain the FireSmart webpage on the City of Vernon website.

Action #2: Promote FireSmart information and wildfire preparedness with social media.

Action #3: Develop a communication strategy regarding FireSmart education on wildfire risk and the CWRP priority mitigation measures that are being undertaken within and by the community.

Action #4: Organize a Wildfire Community Preparedness Day on an annual basis to promote the principles of FireSmart and increase community engagement. This should be held annually between May and October.

Action #5: Increase Vernon Fire Rescue Service involvement with FireSmart promotion in community.

Action #6: Make available FireSmart BC education materials into School District 22 curriculum.

Action #7: Offer Home Ignition Zone assessments for residents in high priority neighborhoods and encourage residents to implement recommendations from the assessment.

Action #8: Increase CoV FireSmart Capacity. Hire summer students and term Wildfire Mitigation Specialists.

6. LEGISLATION AND PLANNING

Legislation and Regulation can be a very effective tool for reducing wildfire risk on provincial crown lands and within the administrative boundaries of a local government or First Nation communities. Provincial acts and regulations provide the means for local governments and First Nation communities to implement wildfire risk reduction actions through by-laws.

There are several types of provincial and federal legislation, including acts and regulations, that support or influence the CWRP planning process. The City of Vernon may utilize or amend existing bylaws or establish and implement new ones to meet objectives intended to reduce wildfire risk in the area.

6.1 RELEVANT LEGISLATION AND HIGHER-LEVEL PLANS

In BC, there are several legal responsibilities and obligations relevant to wildfire use, prevention, control, and rehabilitation. The most critical provincial legislation and regulation are the *Wildfire Act,* and *Wildfire Regulation*. Other BC Provincial wildfire-related legal requirements are included in the following Acts and Regulations:

- *BC Forest Act*
- *BC Professional Governance Act*
- *BC Forest and Range Practices Act*
- *BC Park Act*
- *BC Environmental Management Act*
- *BC Hydro and Power Authority Act*
- *BC Building Act*
  - Allows local governments and First Nations to create Development Permit Areas (DPAs) that include wildfire risk reduction requirements
- *BC Emergency Program Act*
- *BC Local Government Act*
  - Wildfire risk reduction is incorporated through bylaw adoption and administering new development e.g., designating DPAs through Official Community Plans (OCPs) or other bylaws
- *BC Open Burning Smoke Control Regulation*

6.2 MINISTRY PLANS

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

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

- critical values at risk
- identified areas where wildfire is advantageous, and where wildfire is detrimental, with descriptions of conditions such as season and fire weather information
- areas planned for prescribed fire (e.g., ecosystem health, maintenance, wildfire threat reduction, silviculture purposes, etc.)
- identified areas for mechanical fuel management treatments near values requiring protection from wildfire
- forest and range activities that could help protect landscape values from wildfire
- relevant First Nations and cultural values[36]

Although not available to the public, the fire management plan for the Okanagan Shuswap Natural Resource District was viewed by Frontline Operations Group in 2015. At that time, the plan contained 15 pages of text, alongside maps that were categorized into four "priority themes" as follows:

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

[36] Fire Management Planning. FLNRORD Policy Manual, Volume 1 – Resource Management.

It is unclear what the long-term plans are for the maintenance of the district fire management plans. When previously reviewed, the Okanagan Shuswap District fire management plan was a generalized high-level snapshot, not overly useful for wildfire protection planning at the community level.

Additional useful wildfire planning, and implementation can be achieved through the development of a Wildland Urban Interface Wildfire Risk Reduction Plan (previously Wildfire Risk Reduction Tactical Plans) for Crown land areas in and about the North Okanagan area. Tactical plans assess wildfire risks at a high-level, which are then incorporated into landscape fire management and treatment designs[37]. The kinds of fuel management treatments that are often designed in tactical plans are those that are typically larger in scale and most often implemented through mechanized treatment methods that incorporate timber extraction for the purpose of offsetting treatment costs.

6.3 LOCAL GOVERNMENT PLANS AND POLICIES

The City of Vernon *2023-2026 Council Strategic Plan* has identified *Building Resilience and Wildfire Management* as a key area of focus. In line with this objective, the city plans to review and update the *Tree Protection Bylaw #4152* to encourage FireSmart practices and promote shade. The *Landscaping Standards Bylaw #5015* will also be revised and implemented to align with FireSmart principles. These measures aim to reduce wildfire hazard and risks to the community and promote sustainable landscaping practices that contribute to overall resilience.

Finally, the Emergency Plan includes an *Emergency Program Bylaw (No. 5862)*. The intention of the Bylaw is to develop and implement plans for emergencies and disasters pursuant to the Emergency Program Act. These bylaws and others pertinent to the CWRP are listed below in **Table 22**.

Table 22. *Summary of bylaws for the City of Vernon relevant to the Community Wildfire Resiliency Plan.*

Bylaw	Description	Relationship to CWRP
Tree Protection Bylaw #4152	A bylaw for the management and protection of trees within the City of Vernon.	Bylaw is being reviewed in 2024 to better encourage FireSmart practices and shade retention.
Landscaping Standards Bylaw #5015	A bylaw to require owners or occupiers to install landscaped areas on property that they own or occupy according to standards.	Bylaw is being reviewed in 2024 to better support FireSmart principals.
Emergency Program Bylaw # 5862	A bylaw to develop and implement plans for emergencies and disasters in the City pursuant to the Emergency Program Act, R.S.B.C. 1996, c. 111	Develop bylaw/ plans to mitigate wildfire risk to community.

[37] Wildland Urban Interface Wildfire Risk Reduction Plan. BC Wildfire Service.

Bylaw	Description	Relationship to CWRP
Fire Services Bylaw #5635	A bylaw to regulate and impose requirements in relation to the Municipal Fire and Emergency Services, fireworks, outdoor burning, and the safety and protection of persons and property.	Outlines regulations and procedures governing fire prevention, suppression, and emergency response within the jurisdiction of Vernon.
Good Neighbor Bylaw #4980	A bylaw to enhance the Quality of Life for the citizens of the City of Vernon.	Part VI – Nuisance Smoke – rules surrounding campfires and outdoor fires within the jurisdiction of Vernon.

The following are recommended action items regarding FireSmart legislation and planning:

Action #9: As updates and amendments are made to the CoV City Plan, Emergency Plan and other planning documents, incorporate consistent FireSmart planning objectives, language and terminology.

Action #10: Explore updating Bylaws to prohibit fireworks and campfires during high fire risk period of the year.

Action #11: Increase fines for repeat or egregious behavior**.**

Action #12: Amend any existing bylaws regarding boulevards or easements to: (i) prohibit residents from planting/growing any vegetation on City property, (ii) prohibit planting of coniferous shrubs and trees on City property by residents, (iii) replace existing coniferous vegetation with deciduous.

Action #13: Prohibit planting of coniferous trees & shrubs on private property within 10m of homes or structures or for the purposes of privacy screening: (i) property owners may replace existing coniferous vegetation with deciduous; or (ii) seek exemption of height restrictions on fencing from the City.

Action #14: Amend any existing bylaws for fence heights along roadways or public corridors to allow for exemptions from fencing height bylaws for taller fences for privacy & noise reduction. Alternatively, provide a streamlined process for exemption request to build taller fences adjacent to roadways or public corridors.

7. DEVELOPMENT CONSIDERATIONS

Development decisions, such as land use types, structure density, road patterns, and other considerations, shape the built and natural environments. These decisions can bring lasting impacts to the WUI and wildfire risk by affecting public and first responder safety and survivability of homes, critical infrastructure, and other community features. Considering these factors early in the development process can reduce wildfire risk to life safety and property.

Whether in the design stage, building, or performing renovations, there are many ways land use planning and development standards can help protect homes and communities from wildfires. The relationship between the built and natural environments must be recognized and planned for with any community-based expansion or development.

The City of Vernon has an Official Community Plan (Bylaw No 5470, 2013), within which are planning and development considerations regarding wildfire resiliency. The plan uses recommendations from the 2014 CWPP and adopts three fire interface areas within the city boundary. The 2014 CWPP is the guiding document for managing the community's wildfire risk and protection.

7.1 INTERFACE AREAS

Based on results found in the 2014 CWPP, the City of Vernon adopted three Interface Areas (**Figure 16**)[38]. Each area has a different forest type or fuel complex and resulting wildfire threat potential. The three areas are described briefly below.

1. **Interface Area 1:** Fully developed areas with irrigated and managed agricultural fields or minimal forest fuels are characterized by segmented patches of a low wildfire threat. While there is still a potential for airborne embers to pose a risk to individual structures, these areas cannot sustain consistent wildfire spread, and the spotting potential is minimal.
2. **Interface Area 2:** Interface Area 2 encompasses grassland ecosystems within the city boundaries, characterized by unmanaged grasslands with dominant bunchgrass cover and scattered Ponderosa Pine and Douglas-fir trees. These ecosystems are susceptible to fast-moving surface wildfires from early spring until green-up and from July through October, with low-intensity fire spread driven by wind and slope. Spotting is limited and occurs over

[38] Vernon Community Wildfire Protection Plan (CWPP). 2014.

short distances. Unprotected structures risk a direct threat if the fire can spread directly to the buildings.

3. **Interface Area 3:** Interface Area 3 encompasses conifer-dominated forest ecosystems located mainly in the southwest and northeast portions of the city. These forests, primarily consisting of Douglas-fir with some Ponderosa Pine, are prone to intense, fast-moving crown fires during typical summer weather conditions. Without active management, these stands can have continuous surface fuels, suppressed understory, heavy ladder fuels, and a mature conifer component with low live crowns, enabling regular candling and crowning conditions that can surpass wildfire suppression efforts. The poor forest health, caused by factors like poor soils, moisture and nutrient competition, pests, and extensive tree mortality, further complicates wildfire management. The scattered subdivisions and homes throughout the area and significant spotting from airborne embers during crown fires directly threaten all structures within and near Area 3.

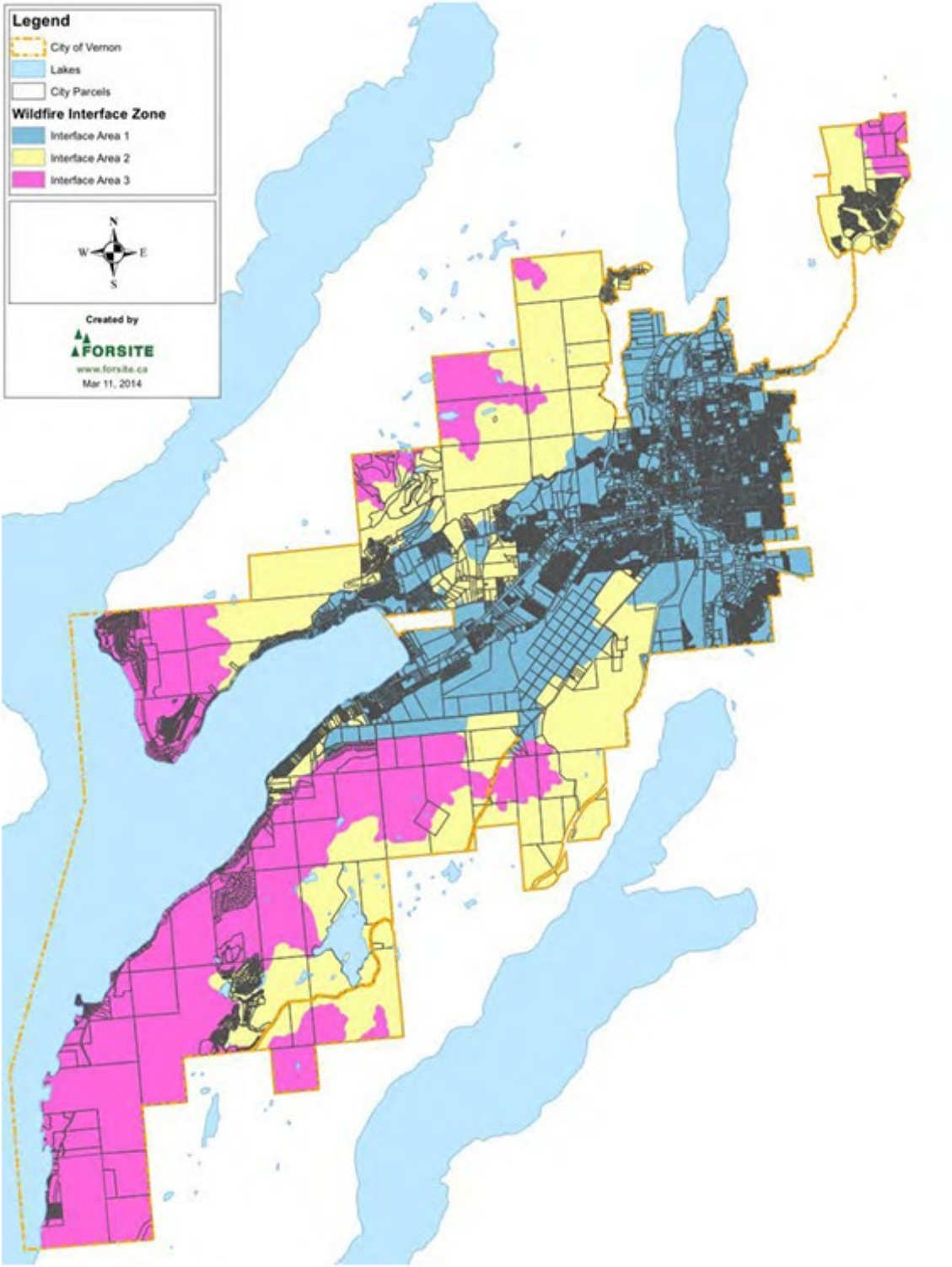

Figure 16. City of Vernon Interface Zones[39].

7.2 DEVELOPMENT PERMIT AREA

The City of Vernon Official Community Plan has a devoted policy, *22.0 Fire Interface*[40]*.* The goal of the *22.0 Fire Interface* policy is to accurately identify and map the high-hazard risk in the identified Interface Zones. This goal is supported by several policies, notably the following.

- 22.1 Endorse the use of the Vernon Community Wildfire Protection Plan, as amended, as the guiding document for the management of fire risk and for wildfire protection in the community.
- 22.4 Encourage clustered development in Interface Areas 2 and 3 (**Figure 16**).
- 22.5 Encourage the development of trails in neighborhoods in Interface Areas 2 and 3 to be designed as fire breaks, where feasible.

Development Permit Guidelines are intended to guide any new development within designated areas. Policies specific to wildfire were intended to provide applicants and staff with encompassing guidelines for growth in the City of Vernon. Notably, 26.20 policy from the Community Plan states that all areas "as within Interface Areas 2 and 3 should be designed to comply with FireSmart BC guidelines and the Community Wildfire Protection Plan". A Section 219 covenant may be used to ensure that best practices are being followed. Where a proposed development does not comply with FireSmart BC guidelines, a Wildfire Interface Management and Mitigation Plan (WIP) is required as part of the development process. In addition, 29.13, which covers the Hillside Residential and Agricultural District, says any subdivision plans will require a fire hazard assessment from a registered professional forester and any consequent recommendations to reduce fire hazards.

The following are recommended action items regarding FireSmart development considerations:

Action #15: Use the FireSmart Critical Infrastructure Guide and Hazard Assessment Form to assess critical infrastructure vulnerability to wildfire in AOI.

Action #16: Upgrades or development of new critical infrastructure should be based on outcomes from the Critical Infrastructure FireSmart Assessment and constructed with fire-resistant construction materials.

Action #17: Construct perimeter trails in Interface Areas 2 and 3 as previously identified in the 2014 CWPP.

[39] City of Vernon Community Wildfire Protection Plan. 2014.
[40] City of Vernon Official Community Plan. 2013.

Action #18: Establish a Development Permit Area (DPA) for Wildfire Protection for new development/buildings within the identified Interface Areas to require fire resistant landscaping or other FireSmart considerations, such as fire-resistant building materials for roofs, decking, etc.

8. INTERAGENCY COOPERATION

It takes the collaborative efforts of multiple stakeholders working together to achieve a fire resilient community. These people include the local fire departments, local government staff, elected officials, First Nations representatives, industry representatives and provincial government residents in your area. Individually they are responsible to their own organizations, but all of the stakeholder organizations are dependent upon each other to develop an effective Community Wildfire Resiliency Plan and undertake a successful wildfire response.

Like other natural hazards, administrative boundaries unto themselves have little to no impact on the spread of wildfire. Addressing wildfire hazards requires a collaborative and shared approach that recognizes jurisdictional responsibilities. From a wildland firefighting perspective, the jurisdictional fire response responsibilities are well defined and supported by direct firefighting budgets that fund task-specific equipment, personnel, and training (e.g., the BCWS and the Vernon Fire Rescue Services). Procedures and agreements are in place to enable the requisition and provision of mutual aid when a fire strains the resources of a fire response agency or department[41]. During incidents or disasters, responding resources are guided by the principles of the Incident Command System (ICS) and the BC Emergency Management System[42].

Since establishing the FireSmart Coordinator position in 2021, Vernon has significantly enhanced wildfire resilience. By transitioning the FireSmart Coordinator to a full-time role, funded by the City of Vernon, the City has ensured continuity in its FireSmart management efforts. This increased commitment has led to notable achievements, including the participation of the FireSmart Coordinator as a panelist at the 2023 and 2024 *Wildfire and Resiliency Training Summit*.

Moreover, the City of Vernon has taken a significant step towards integrating wildfire resiliency efforts across various departments by creating a large FireSmart Taskforce. This collaboration was evident at the *2023 Wildfire and Resiliency Training Summit*, where multiple City departments were represented. By fostering this multifaceted approach, Vernon is better positioned to develop comprehensive wildfire resiliency strategies and achieve a more cohesive response to wildfire risks. Integrating wildfire management efforts with broader city planning initiatives allows for increased advocacy and messaging support for wildfire resilience throughout the City. These advancements

[41] For example, the Memorandum of Agreement for Inter-agency Operational Procedures and Reimbursement Rates between the Fire Chiefs Association of BC and the BC Wildfire Service: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/wildfire-response/inter-agency_agreement.pdf

[42] Emergency Management in BC.

underscore the City of Vernon's dedication to building a more resilient and wildfire-ready community.

As FireSmart has continued to become established in BC in recent years, additional focus has been placed on the coordination of efforts across stakeholder groups. Central to this coordination is the establishment of a Community FireSmart and Resiliency Committee (CFRC). The purpose of the CFRC is twofold. First, the Committee is responsible for reviewing and implementing the CWRP, monitoring for funding opportunities via CRI or other sources and work effectively to implement the seven FireSmart disciplines within their community. Second, the Committee is a mechanism for bringing together local communities and provincial agency staff with stakeholders to collaboratively coordinate, plan and share information on FireSmart activities at a local and regional level.

The following are recommended action items regarding interagency cooperation:

Action #19: Maintain active engagement and participation in the established Community FireSmart and Resiliency Committee (CFRC) (required by 2024 for success to CRI funding).

Action #20: Engage with operators (e.g., BC Hydro, Fortis BC, Vernon Airport) to encourage completion of FireSmart assessments for privately owned critical or hazardous infrastructure.

Action #21: Engage with Department of National Defense to assess wildfire risk on their private land.

9. CROSS-TRAINING

Wildland-Urban Interface resiliency planning and incident response draw on many different professions who do not typically work in wildfire environment. Cross-training of fire fighters, public works staff, utility workers, local government and First Nations administration, planning and logistics staff, and other key positions will help support the development of comprehensive and effective wildfire risk reduction planning and activities, as well as a safe and effective response.

There are numerous FireSmart training and cross training opportunities available from the FireSmart Community Funding and Supports Program funded through CRI. FireSmart brings together many different people and groups who may not typically work in a wildfire environment, and the funded training opportunities are intended to help create a common foundation upon which local wildfire preparedness, prevention and response resiliency can develop.

The 2023 FireSmart Community Funding and Support Program will fund the following FireSmart training and firefighter cross-training:[43] [44]

- Training for FireSmart positions (e.g., FireSmart Coordinator)
- Local FireSmart Representative
- Wildfire Mitigation Specialist (initial training and annual renewal fee)
- Wildfire Risk Reduction Basics
- Fire & Life Safety Educator
- ICS-100 Incident Command System introduction
- SPP-WFF1 Wildland Firefighter Level 1
- S-100 Basic Fire Suppression and Safety
- S-185 Fire Entrapment Avoidance and Safety
- S-231 Engine Boss
- WSPP-115 Training for structure protection crews
- Task Force Leader
- Structure Protection Group Supervisor
- Introduction to Emergency Management in Canada

Cross-training opportunities are also available for students in School District 22 through the BC Wildfire Service Junior Firefighter Program. Each summer, the Vernon Fire Zone offers employment

[43] As the CRI funding program guides change year to year, applicants must consult the guide that matches the intake that they are applying for.
[44] Cross-training. FireSmart BC.

to three grade 11 or 12 students during the fire season. This program is a valuable platform for students transitioning out of high school to acquire professional experience in the field. In addition, by hiring local students, they gain an opportunity for growth, enhance community engagement, and foster greater awareness of the wildfire realm among community members.
The following are recommended action items regarding cross training opportunities:

Action #22: Conduct annual multi-agency training exercises focused on interface wildfire response with BCWS.

Action #23: Continue to support and celebrate the BCWS Vernon Zone Junior Wildfire Firefighter Program.

Action #24: Continue to provide S100 training to CoV operation workers.

10. EMERGENCY PLANNING

Community preparations for a wildfire emergency requires a multi-pronged approach. Individuals and agencies need to be ready to react by developing plans, mutual-aid agreements, resource inventories, training and emergency communication systems. All of these make it possible for a community to respond effectively to the threat of wildfires as a whole.

Emergency management in BC (and most other jurisdictions) is centered around a four-phased interconnected approach that consists of mitigation, preparedness, response, and recovery (**Figure 17**). It is important to recognize that a CWRP is not intended to supplant a local government's legally required emergency plan. Rather, the bulk of a CWRP primarily addresses two of the four phases of emergency management: mitigation and preparedness. Additional information may be included in a CWRP that may help to inform future updates to a local government's emergency plan, including specific details of response and recovery.

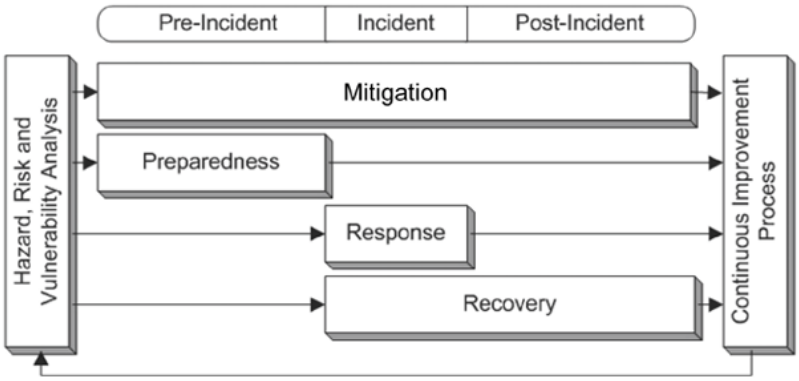

Figure 17. Emergency management is a four-phased interconnected approach. Image credit: Province of BC.

Large wildland urban interface fires are often complex incidents that typically involve both wildland and structural firefighting resources. During wildfire emergencies that threaten the WUI, evacuation alerts, orders and a state of local emergency declaration may be required in the interest of public safety and to enable a local authority to utilize emergency powers.

During periods when numerous large fires are burning in BC and threatening multiple communities simultaneously, the demand for response resources may exceed availability. The Province of BC deploys resources according to the *Provincial Coordination Plan for Wildland Urban Interface Fires* (2016), the *BC All-Hazard Plan* (2012) and the *BC Emergency Management System* (2016).

10.1 EMERGENCY MANAGEMENT PLAN

As per the *Emergency Program Act*, all local governments are required to prepare local emergency plans that include provisions for mitigation, preparedness, response and recovery from wildfire. The City of Vernon's Emergency Management program is managed through the City's Fire Rescue Services. The program is designed to support citizens and emergency agencies, including RCMP, Fire Rescue Services, and BC Ambulance Service. Vernon also has implemented an Emergency Alert Notification System (*Alertable – Community Notifications*) available to citizens through an online sign-up platform. The plan was last reviewed in September 2022. Furthermore, the City of Vernon conducts periodic training sessions from its Emergency Operations Center, where the City's management team tests responses to probable events, including an interface wildfire. These training exercises enhance the city's emergency preparedness and coordination in the face of potential wildfire scenarios.

The City of Vernon Emergency Plan includes the following pertinent information:

- Vulnerabilities based on Hazards, Risks and Vulnerability Assessment (HRVA)
- Site Level and Incident Commander Systems (ICS)
- Emergency Operations Centre Structure
- EOC Management Team
- EOC Activation Levels
- Emergency Management Roles and Responsibilities
- Communications
- Evacuation Plan
- Event Specific Evacuation Planning and Implementation
- Hazard Specific Emergency Guidelines – Wildfires

In 2017 the City of Vernon completed a Hazards, Risk and Vulnerability Assessment (HRVA). The HRVA found vulnerabilities with potentially significant consequences. As a result, the three primary concerns are:

1. Interface and wildfires.
2. Floods.
3. Dangerous goods spills.

10.2 WILDFIRE PREPAREDNESS PLANNING

The City of Vernon should develop local daily action guidelines based on expected wildfire conditions and preparedness levels. **Table 23** provides an example of daily action guidelines,

based on *Canada's National Guide for WUI Fires*[45]. As of spring 2023 the BC Wildfire Service Vernon Zone has engaged with VFRS to develop a pre-incident wildfire response plan.

Table 23. Example Wildfire Response Preparedness Condition Guide (Bénichou, et al., 2021).

WILDFIRE RESPONSE PREPAREDNESS CONDITION GUIDE	
Prep-Con LEVEL	**ACTION GUIDELINES**
I LOW	• All Community staff on normal shifts. • Staff will update fire danger signs.
II MODERATE	• All Community staff on normal shifts.
III HIGH	• All Community staff on normal shifts. • Daily detection patrols by staff. • Regional fire situation evaluated. • Daily fire behaviour advisory issued. • Wildland fire-trained Community staff and EOC staff notified of Prep- Con level. • Establish weekly communications with local wildland fire agency contacts • Hourly rain profile for all weather stations after lightning storms. update fire danger signs.
IV EXTREME	• Rain profile (see III). • Daily detection patrols by Staff. • Daily fire behaviour 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.

[45] National Guide for Wildland-Urban Interface Fires. Natural Resources Canada.

WILDFIRE RESPONSE PREPAREDNESS CONDITION GUIDE	
Prep-Con LEVEL	**ACTION GUIDELINES**
V FIRE(S) ONGOING	• All conditions apply as for Level IV (regardless of actual fire danger rating). • Provide regular updates to media/structural fire departments/park 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 behaviour prediction and under the direction of the Fire Chief.

10.3 VERNON FIRE RESCUE SERVICES EQUIPMENT

As discussed in Community Information (3.3), Vernon has two fire halls staffed with permanent firefighters, ensuring consistent fire protection for the community. Additionally, a third fire hall situated at Predator Ridge is staffed during periods of extreme fire risk.

The Predator Ridge fire hall is also equipped with an emergency siren warning system, to alert residents about potential wildfire threats.

As of 2023, Vernon Fire Rescue Services is supported by the following personnel:

- Fire Chief, Director Fire-Rescue Services
- 40 career fire fighters in operations
- 15 auxiliary fire fighters
- 1 Training Officer
- 1 Fire Prevention Officer
- Deputy Fire Chief, Operations
- Deputy Fire Chief, Prevention & Life Safety
- Deputy Fire Chief, Emergency Management
- Emergency Program Coordinator
- Fire Smart Coordinator
- Executive Assistant to the Fire Chief
- Emergency Management Secretary

The VFRS is also equipped to respond to wildland fire incidents and has the following equipment:

- Type 2 Structure Protection Unit Trailer
- 4 Type 1 Structural Engines
- 4 Light Duty Command Vehicles
- Type 3 Wildland Engine F-550 pickup truck

- 2 Type 2 Tactical Water Tenders
- Mutual Aid agreements with neighbouring jurisdictions
- Access to City water trucks
- Nomex and Personal Protective Equipment for wildfires

10.4 VERNON FIRE ZONE

The City of Vernon has the advantage of being located near the BC Wildfire Vernon Fire Zone office at 235 Bailey Rd above Kalamalka Lake. This location serves as a strategic advantage for the City. The Bailey Rd office is supported by a dedicated team of personnel, including a Type 1 Unit Crew consisting of 20 individuals and four Initial Attack Crews (16 people). While these wildfire crews are provincial resources and may be deployed across the province for up to two weeks, opportunities exist for cross-training and community engagement during low-fire danger periods. These interactions can provide valuable knowledge exchange and foster a strong relationship between the wildfire crews and the local community.

10.5 STRUCTURE PROTECTION

The ability to undertake structure assessments and plan and deploy structure protection sprinklers is usually impossible during a developing WUI fire. As a recently ignited wildfire spreads, resources are often dedicated to life, safety, and fire control, with no wiggle room to dedicate structure protection units (SPUs) and crews to secondary values. SPU crews and specialists are most often deployed to longer duration wildfires, or those that could become longer duration, as extensive areas require SPU capability. In these cases, Type 1 SPU trailers are often deployed.

10.6 SENSENET COVERAGE

Over the last several years, the City of Vernon has worked closely with SenseNet, a private company that has been developing new technology which promises to provide early detection of wildfires directly to fire services and emergency operations centers[46]. The project represents a significant milestone—it is the first large-scale testing of this emergent technology. Nearly 150 sensors have been placed throughout the City of Vernon, and its capacity is expandable to include an unlimited number of sensors (**Figure 18**). Developers, strata boards, and other stakeholders can add to the system to better protect their specific values.

[46] To learn more about SenseNet visit: https://www.sensenet.ca/

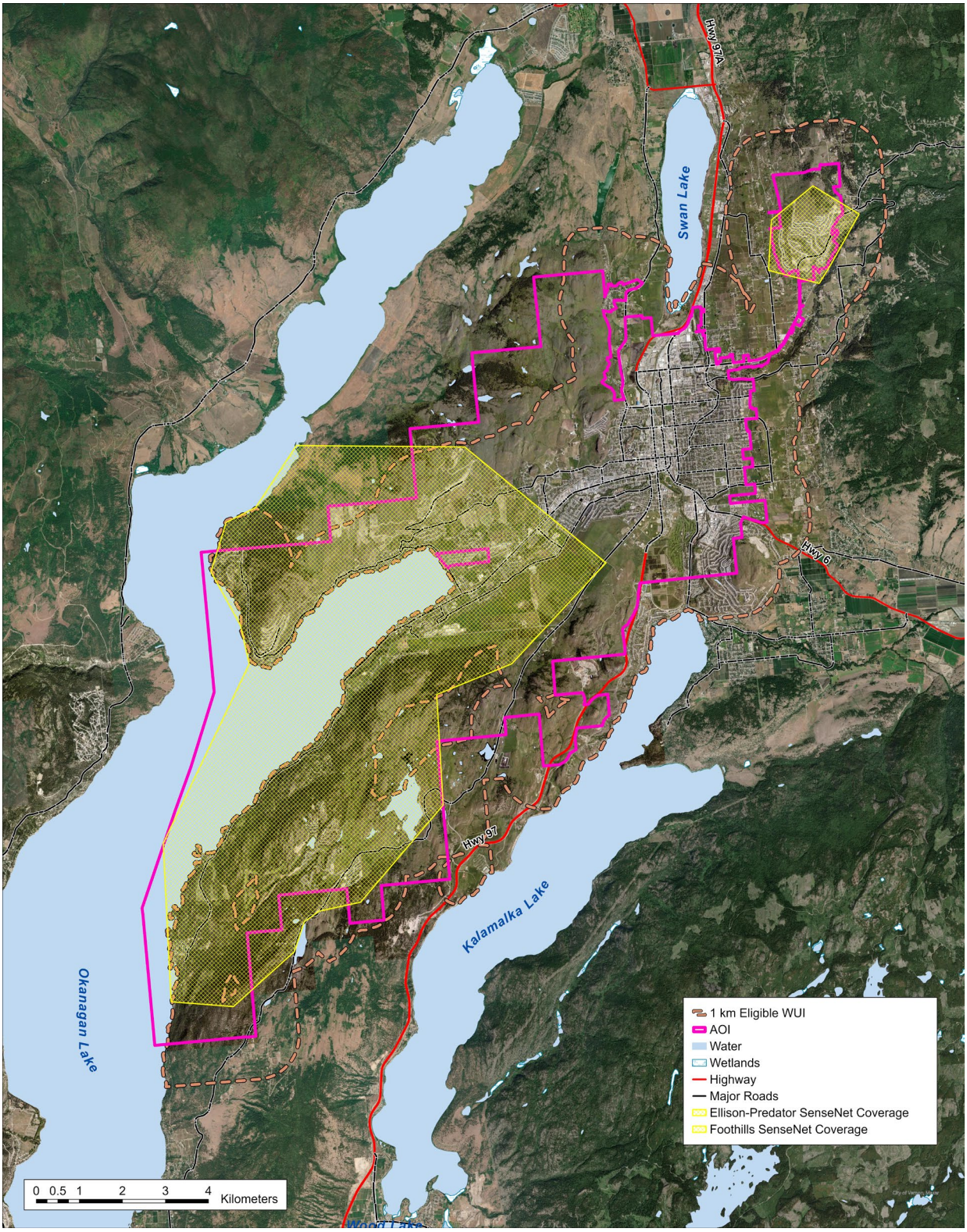

Figure 18. SenseNet coverage in the Vernon area.

10.7 LESSONS LEARNT – TERRACE MOUNTAIN AND WHITE ROCK LAKE WILDFIRES

In July 2009, the Terrace Mountain fire originated west of Terrace Mountain and quickly gained momentum, resulting in a significant threat to the area. Over three weeks, the fire spread aggressively, consuming approximately 9,300 hectares of land under extremely dry conditions. As highlighted in the 2014 Vernon CWPP, this fire posed a severe and direct threat to the community. Fortunately, diligent efforts managed to halt the fire's progression south of Shorts Creek. However, it's important to note that the prevailing summer winds, typically from the south or southwest, could have easily directed the wildfire toward the city. Furthermore, the evening lake effect intensified the fire's eastern edge, leading it to burn downhill and towards the lake and lakeside developments.

Another notable wildfire that impacted the vicinity of Vernon was the White Rock Lake fire, which was first detected on July 13th, 2021. By the end of the fire season, it had consumed a total of 83,342 hectares. This fire exhibited similar fire behavior to the Terrace Mountain fire in 2009. The strong winds, influenced by the lake effect, drove the fire downslope from the Interior Plateau towards the Okanagan Indian Band and Killiney Beach area. On August 6th, the fire prompted evacuation alerts for the City of Vernon and Armstrong. Regrettably, the fire destroyed 78 properties in the Ewings Landing, Monte Creek, and Killiney areas.

Kin Racetrack, located south of Swan Lake adjacent to Kal Tire Place, was used as a BCWS Fire Camp for the White Rock Lake wildfire during the 2021 fire season. At the height of its capacity, the Fire Camp was servicing and hosting nearly 500 people to support the wildfire suppression efforts. Vernon Fire Rescue Services Chief Lind remarked that the utilization of Kin Racetrack as a Fire Camp was successful. However, this area is slated for development in the coming months.

Lessons learned from the Terrace Mountain and White Rock Lake fires include;

1. Wildfires have the capacity to spread aggressively downhill along Okanagan Lake due to the downdraft effect in early evening (applicable to Kalamalka Lake too).
2. Fuel breaks or low fuel loading zones on the mid to upper slopes help successfully combat a wildfire on the height of land above urban developments.
3. Wildfires spreading from the south, southwest and west pose the largest threat to the City of Vernon.
4. Vernon Fire Rescue Services needed to embed a liaison into the BC Wildfire Service when the White Rock Lake fire was initially detected as a threat to Vernon.
5. Amalgamating career and auxiliary structural crews increased the strength of crews and ensured experienced fire fighters supported and supervised those with less experience.
6. Vernon City Works crews strengthened fire response within the City of Vernon and supported as water tenders. These operators are now trained with S100 and are provided PPE (as of June 2023).

The following are recommended action items to further enhance Emergency Planning:

Action #25: Promote and encourage Vernon residents to sign-up for the CoV Emergency Alert Notifications through social media, newspaper, radio etc.

Action #26: Complete annual testing of Emergency Management Plan.

Action #27: Create a wildfire incident pre-plan and test annually.

Action #28: Identify municipal buildings that can be used as clean air shelters for public during times of poor air quality for public.**28**

Action #29: Develop local daily action guidelines based on expected wildfire conditions and preparedness levels.

Action #30: Explore opportunities for secondary egress routes across the municipality in high-risk areas.

11. VEGETATION MANAGEMENT

The general 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 a community. A well-planned vegetation management strategy that is coordinated with development, planning, legislation and emergency response wildfire risk reduction objectives can greatly increase fire suppression effectiveness and reduce damage and losses to structure and infrastructure.

Within the context of wildfire risk reduction, vegetation management encompasses strategies aimed at manipulating vegetative fuels to mitigate the potential hazards they pose to valued societal features. This involves actions taken at various scales, prioritizing reducing fuels and potential wildfire behaviour that present the highest threat to the community's homes, businesses, and critical infrastructure. Vegetation management is generally conducted with two primary levels of focus and responsibility:

1. **Residential FireSmart Activities:** These activities target the Immediate, Intermediate and Extended Zones. These zones are strategically selected to maximize the reduction of fuel hazards around residential areas.

2. **Stand or Landscape-Level Treatments:** These interventions address fuel complexes that could pose hazards to the Wildland-Urban Interface (WUI).

11.1 WILDLAND URBAN INTERFACE DISASTERS

Notably, a significant portion of the land within the municipal boundaries of the City of Vernon, 88.0%, is privately owned, while the local municipal government owns 4.3%. Therefore, the implementation of fuel management treatments on Crown land are limited and a robust FireSmart program is essential. The area's private landowners collectively are responsible for reducing fire hazards on their properties.

Research investigating recent WUI disasters presents the case that catastrophic loss of homes due to wildfires is often due to structure ignition from **ember showers** which can ignite fuels

surrounding, or in contact with, the structure[47,48]. Once a home or other infrastructure is ignited, the fire can spread through the built environment and quickly overwhelm suppression resources.

The preliminary findings of a 2023 FPInnovations study on the McDougall Creek wildfire revealed that embers caused nearly all structure ignitions, often igniting nearby vegetation or flammable materials on decks, which then spread to the structures. The study looked at 117 structures burnt by the fire and found only one structure had evidence of direct flame contact from the wildfire - embers ignited or contributed to the damage on all others. Strong winds carried embers significantly, and once structures caught fire, they generated more embers, perpetuating the spread. Effective measures to combat ember ignitions included managing vegetation, using fire-resistant materials, maintaining a green zone around structures, removing yard debris, and using sprinklers to dampen areas.

The findings from the 2021 Lytton disaster (British Columbia) cannot be understated. The wildfire passed over the community in less than one hour. After which, the fire was perpetuated throughout the Village and Indian Reserves along four different spread paths from structure to structure. Most structures destroyed in the Lytton fire were ignited by other structures and urban fuels, not from the influence of the wildfire (**Figure 19**).[47]

Figure 19. Image of Lytton, BC, after the 2021 wildfire showing unburned vegetation surrounding destroyed homes and structures. Source: CBC.

[47] Cohen JD, Westhaver A. 2022. An Examination of the Lytton, British Columbia wildland-urban fire destruction. Summary Report to the British Columbia FireSmart Committee. Available: https://firesmartbc.ca/wp-content/uploads/2022/05/An-examination-of-the-Lytton-BC-wildland-urban-fire-destruction.pdf

[48] Knapp, E.E., Valachovic, Y.S., Quarles, S.L. et al. 2021. Housing arrangement and vegetation factors associated with single-family home survival in the 2018 Camp Fire, California. fire ecol 17, 25. Available: https://doi.org/10.1186/s42408-021-00117-0

11.2 FIRESMART TEST NEIGHBORHOOD AND AERIAL ASSESSMENT

The City of Vernon has recognized the need to create more resiliency through mitigating wildfire hazards and has initiated a FireSmart test neighborhood and aerial assessment project. This multi-year project will assess all City-owned lands, right-a-ways, green spaces and boulevards. Once completed, high-priority areas will be mitigated first, followed by moderate and low areas. The need to support homeowners in creating defensible spaces requires the City of Vernon to remove the continuity of fuels leading to homes. These efforts will help build the City of Vernon's wildfire resiliency through proactive measures and help response crews defend life and property.

11.3 WHITE ROCK LAKE FIRE AND WESTSHORE ESTATES FUEL TREATMENTS

Westshore Estates on the west of Okanagan Lake was successful in implementing a landscape fuel break as per recommendations from the 2014 Vernon CWPP, which suggested, as listed above, that fuel breaks or low fuel loading zones on the mid to upper slopes help successfully combat wildfires on the height of land above urban developments. Completed in 2020, the White Rock Lake fire tested the Westshore Estates landscape fuel break in 2021. The treatment area (between the red line and homes in the image below) had the fire burn into it and then slow enough to allow fire departments to attack it and save the houses from impact.

Figure 20. Westshore Estates landscape fuel break.

11.4 FUEL MANAGEMENT SINCE 2014

The City of Vernon has successfully implemented a comprehensive fuel treatment program in line with the recommendations of the 2014 CWPP. Most priority areas identified in the 2014 CWPP have undergone fuel management (**Table 24**) (**Figure 21**). The following steps should prioritize a transition towards regularly scheduled maintenance treatments. However, a challenge while drafting this report was the need for a comprehensive record of treated areas within the City of Vernon. Moving forward, efforts should be directed toward systematically monitoring, documenting, and tracking this information to ensure transparency and support informed decision-making.

Table 24. Recommendations from the 2014 CWPP and the status of recommendations.

Recommendation from 2014 CWPP				
Priority	**Treatment Area**	**Area (ha)**	**Description**	**Status as of 2023**
1	B	30.23	Ellison Park - Douglas-fir and mostly dead Ponderosa Pine forest with high surface fuel loads	Treated
2	A	13.44	Ellison Park - Douglas-fir and mostly dead Ponderosa Pine forest with high surface fuel loads	Treated
3	D	5.64	Sunset Properties - narrow strip of rocky Douglas-fir on steep slope on southern perimeter of community	Treated
4	D2	0.75	Sunset Properties-narrow strip of forest in northern portion of the community	Treated
5	C	7.52	Unmanaged Park space at Predator Ridge - Douglas-fir, ponderosa pine forest on the south edge of the community, partly cleared	Not treated
6	E	5.84	Tronson Road - Strip for Douglas-fir on very steep slope between lakeshore and road, partly cleared, limited access	Prescription in place
7	F	18.18	North Side of Tronson Road development on Okanagan Indian Band I.R #1 steep Douglas-fir stand	Unknown
8	G	6.76	Unmanaged park land - very steep Douglas-fir stand with high dead standing component	Unknown
	Total	**88.63**		

The City of Vernon has identified the following areas as being recently treated including the associated size of treatments.

Table 25. Areas provided by the City of Vernon that have been recently treated or have plans in place.

Location	*Area (ha)*	*Prescription*	*Burn Plan*	*Date Completed*
Kokanee	8.3	Completed	No burn plan	2021
Foothills	10.1	Completed	Burn plan complete	2020
Apollo Road	5.7 (proposed area)	No prescription	Burn plan created	Anticipated fall of 2024 or spring of 2025
Eastside Road	14	Prescription for 71 ha	No burn plan	Project being implemented in 2024 with completion date of March 2025

Figure 21. Example of a fuel managed stand within the CWRP AOI.

11.5 FTU DEVELOPMENT LIMITATIONS

When developing Fuel Treatment Units for this CWRP, a challenge was determining what fuel management work had already occurred and when. It is recommended that the City of Vernon establish a methodology to spatially track where fuel management treatments are occurring, the scope of the treatment, and an estimated timeline for maintenance moving forward. This approach would enhance the efficiency and effectiveness of fuel management efforts by providing a clear and up-to-date record of past and ongoing activities.

11.6 PROPOSED FUEL TREATMENTS

The proposed vegetation management treatment areas listed below were identified and delineated based on various factors, including proximity to homes, infrastructure, evacuation routes, inherent wildfire hazard of the vegetation, and fire weather conditions. These treatment areas were delineated following fieldwork, which involved collecting field data and conducting spatial analysis. Additionally, discussions with representatives from the City of Vernon were instrumental in determining these areas. The *2022 Wildfire Risk Reduction Strategy for City of Vernon Owned Lands* served as a valuable reference during the development of treatment areas.

Fieldwork revealed that several areas visited had previously undergone fuel treatment work. Therefore, these areas should be considered for maintenance treatments, such as prescribed fire, to ensure their continued effectiveness in mitigating wildfire risk.

FTU #	Total Area (ha)	Treatment Unit Type/ Objective	Local Fuel Threat	Overlapping Values/ Treatment Constraints	Treatment Rationale
1	125.0	Maintenance, fuel treatment unit & prescribed fire	Low	No constraints, adjacent to Eastside Rd	Used *Plot #2 – Ellison Park* to determine wildfire threat. Some areas of TU1 have treatments in place or planned treatments. Treatment area is adjacent to Eastside Rd, which is a rurally populated area with one road in road out access. Maintenance of existing fuel treatment unit will reduce wildfire threat along road and to rural properties.
2	199.8	Maintenance & prescribed fire	Low	Overlap with Ellison Provincial Park, adjacent to Eastside Rd	Area has recently received fuel management treatment. Treatment area is adjacent to Eastside Rd, which is a rurally populated area with one road in road out access. Maintenance of existing fuel treatment unit will reduce wildfire threat along road and to rural properties.
3	7.9	Maintenance & prescribed fire	Low	Adjacent to rural Sunset Properties subdivision	Area has recently received fuel management treatment. Treatment area is adjacent to Eastside Rd, which is a rurally populated area with one road in road out access. Maintenance of existing fuel treatment unit will reduce wildfire threat along road and to rural properties.
4	35.6	Prescribed fire	Low	Adjacent CoV water reservoir	Opportunity to build prescribed burning experience within City of Vernon and partners.

FTU #	Total Area (ha)	Treatment Unit Type/ Objective	Local Fuel Threat	Overlapping Values/ Treatment Constraints	Treatment Rationale
5	8.8	Maintenance & prescribed fire	Moderate	No constraints	Area has recently received fuel management treatments. Maintenance treatment for existing fuel treatment unit.
7	19.9	Fuel treatment unit	Low	Access will be through private property	This area was not surveyed due to access restraints, used *Plot #3 – Sunset Properties* to determine wildfire threat. High threat area behind rural subdivision.
8	8.4	Maintenance & prescribed fire	Low	Located behind Okanagan Landing Elementary School and residential neighborhood	Used *Plot #5 – Reservoir* to determine wildfire threat. Maintenance treatment for existing burn treatment unit.
9	6.4	Fuel treatment unit, maintenance & prescribed fire	Low	Situated between Hospital Hill and Polson Park	Used *Plot #3 – Sunset Properties* to determine wildfire threat. CoV is currently implementing treatments. Vernon Jubilee Hospital is located on top of a bench; steep forested slopes lead up to the hospital on the eastern side. This area has been selected for fuel reduction treatments to reduce the threat of a rapid-fire moving upslope towards the hospital.
10	7.7	Maintenance & prescribed fire	Moderate	Adjacent to residential neighborhood	Maintenance treatment for existing burn treatment unit.

FTU #	Total Area (ha)	Treatment Unit Type/ Objective	Local Fuel Threat	Overlapping Values/ Treatment Constraints	Treatment Rationale
11	5.7	Fuel treatment unit & prescribed fire	Low	Adjacent to residential neighborhood	Target height of grass fuels, downed CWD and low canopy fuels. Area is adjacent to homes.
12	5.2	Fuel treatment & prescribed fire	Low	Adjacent to residential neighborhood	FTU is an urban grass and forested parcel. Area has a history of human fire starts. Main issue of concern is grass height.

The following are recommended action items regarding FireSmart Vegetation Management and fuel treatments:

Action #31: Continue to apply for funding to complete proposed fuel management treatments in remaining identified areas from the 2014 CWPP and 2024 CWRP.

Action #32: Implement a monitoring and maintenance program for completed fuel treatment areas that includes a database outlining treatment strategies, dates, and spatial information.

Action #33: Work with First Nation partners to develop a prescribed fire and cultural burning program and relationship.

Action #34: Promote FireSmart vegetation management principals to private landowners using the FireSmart BC Landscaping Guide.

12. PLAN MONITORING, UPDATES, TRACKING AND REPORTING

The CWRP action plan should be reviewed annually to capture any significant changes that could affect implementation or priority levels, as well as to track which actions have been completed or are in progress. Completed actions should be summarized in this subsection, including information on specific measurable outcomes that demonstrate reduced wildfire risk in Vernon. In addition, a five-year comprehensive review should take place in 2029 including specific updates on:

- How wildfire risk has changed based on recent wildfires;
- Which vegetation management activities have been completed; and
- Any significant changes to the built environment due to growth and development, economic changes, or other factors.

Table 26 provides an example monitoring plan, tracking, and update summary for the City of Vernon CWRP. Annual updates should consider renaming the plan version as 2.1, 2.2, 2.3, etc. Five-year comprehensive updates should consider renaming the plan version as 3.0, 3.1, etc. Columns for actions in progress or completed actions may refer to the action numbers listed in the Action Table. Annual tracking is useful for creating accountability, as well as reporting accomplishments and successes. Summaries of specific measurable outcomes are useful for reporting to decision makers and applying for future funding.

Table 26. Vernon CWRP monitoring, tracking and update summary.

Plan Version	Update Year	Update Type	Actions in Progress	Completed Actions	Notes
1.0	**2014**	**Vernon Community Wildfire Protection Plan (CWPP)**	N/A	Various	N/A
2.0	**2024**	**Vernon Community Wildfire Resiliency Plan (CWRP)**	Ongoing	Ongoing	City of Vernon should schedule an annual review of CWRP and consider if any significant changes have occurred
3.0	**2029**	**Review**	N/A	N/A	As per the *2023 CWRP Instruction Guide*, a five-year comprehensive review should review entire plan.

Appendix A Glossary of Terms

Blow-up - A sudden and unexpected major increase in rate of spread and frontal fire intensity; sufficient to upset overall fire suppression action or plans. Blow-ups can result from small or large fire situations.

Campfire - An open fire that meets both of the following requirements (as defined in the Wildfire Regulation (s.1):

(a) the open fire burns material in one pile no larger than 0.5 m in height and 0.5 m in width;

(b) the open fire is lit, fueled or used

(i) by any person for a recreational purpose, or

(ii) by a first nation for a ceremonial purpose.

Candling - When the foliage on a single tree or a small clump of trees ignites and flares up, usually from bottom to top.

Category 2 open fire - As defined in the Wildfire Regulation (s.1); an open fire, other than a campfire, that burns

(a) material in one pile not exceeding 2 m in height and 3 m in width,

(b) material concurrently in 2 piles each not exceeding 2 m in height and 3 m in width, or

(c) stubble or grass over an area that does not exceed 0.2 ha

Category 3 open fire - As defined in the Wildfire Regulation (s.1); an open fire that burns

(a) material concurrently in 3 or more piles each not exceeding 2 m in height and 3 m in width,

(b) material in one or more piles each exceeding 2 m in height or 3 m in width,

(c) one or more windrows, or

(d) stubble or grass over an area exceeding 0.2 ha

Contained - The status of a wildfire suppression action signifying that a control line has been completed around the fire, and any associated spot fires, which can reasonably be expected to stop the fire's spread.

Control line - All constructed or natural fire barriers and treated (e.g. with retardant or water) fire perimeter used to control or contain a fire.

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.

Duff - The layer of partially and fully decomposed organic materials lying on the forest floor below the litter (layer) and immediately above the mineral soil. When moss is present, the top of the duff is just below the green portion of the moss.

Escaped fire/excursion - A wildfire, or a portion of a wildfire, that has breached a control line and remains out of control following initial attack. This term is also used to describe a prescribed fire that has burned beyond its intended area.

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.

Fireguard - A strategically planned barrier, either manually or mechanically constructed, intended to stop or retard the rate of spread of a fire, and from which suppression action is carried out to control a fire. The constructed portion of a control line.

Fire hazard -the risk of fire starting, and the hazard associated with an industrial activity; and

if a fire were to start, the volatility of the fire's behaviour, the difficulty of controlling the fire, and the potential threat to values at risk.

Fire rank - A numerical value used to communicate a summarized visual assessment of fire behaviour.

Fire risk - Fire risk is a term that combines the probability of fire occurrence with the expected impacts from a fire. It can be defined quantitatively in economic terms or used more generally in a comparative sense; for example, given a similar probability of fire occurrence and spread between different landscapes; *the fire risk at X is greater than the fire risk in Y*.

Although the impacts of fire can be positive, such as when considering the ecological effects or fuel reduction benefits of a wildfire, this term is generally used to suggest negative consequences of fire.

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 smouldering 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 break - a barrier or a change in fuel type or condition (to one that is less flammable than that surrounding it), or a strip of land that has been modified or cleared to prevent fire spread. In the event of fire, may serve as a control line from which to carry out suppression operations.

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

Holdover fire - A fire that remains dormant and undetected for a considerable time after it starts (particularly lightning-caused fires).

Ignition - The beginning of flame production or smouldering combustion; the starting of a fire.

Initial attack - The action taken to halt the spread or potential spread of a fire by the first firefighting personnel to arrive at the fire.

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

Landscape fire management planning - The intent of landscape fire management planning is to create a more fire resilient landscape to mitigate impacts on priority values in an era of increasing fire hazards and risks. The planning identifies zones with a high hazard, and aims to restore fire in the ecosystem.

Litter - The uppermost part of the forest floor consisting of freshly fallen or slightly decomposed organic materials.

Mineral soil - The layer of the soil profile immediately below the litter and duff. Mineral soil contains very little combustible material.

Mop-up - The act of extinguishing a fire after it has been brought under control.

Patrol - To inspect a section of a control line or portion of the fire perimeter to prevent escape of the fire after a wildfire has been contained.

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.

Rate of spread (ROS) - The speed at which a fire extends its horizontal dimensions, expressed in terms of distance per unit of time, usually meters per minute (m/min) and kilometers per hour (km/h). Generally thought of in terms of a fire's forward movement or head fire rate of spread, but also applicable to backfire and flank fire ROS.

Resource management open fire - As defined in the Wildfire Regulation (s.1), an open fire that:

(a) burns un-piled slash over an area of any size, or

(b) is not a campfire or a category 2 or 3 open fire and is lit, fueled or used for silviculture treatment, forest health management, wildlife habitat enhancement, fire hazard abatement, ecological restoration or range improvement.

Risk from wildfire - The exposure to the chance of loss from wildfire. For example, there is a 25% chance that a value at risk will be destroyed by a wildfire sometime in the next 50 years. Risk can also be calculated by multiplying damage (or loss) by uncertainty.

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.

Smoke management - Scheduling and conducting a prescribed burning program under conditions that will minimize the adverse impacts of the resulting smoke production in smoke sensitive areas.

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

Spotting - A wildfire produces burning embers called firebrands. These firebrands are carried by the surface wind, a fire whirl and/or convection column that fall beyond the main fire perimeter and result in spot fires.

Values-at-risk - The specific or collective set of natural resources and man-made improvements/ developments that have measurable or intrinsic worth and that could of may be destroyed or otherwise altered by fire in any given area.

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 - An area in which development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

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.

Appendix B Additional Resources for FireSmart Disciplines

Education

- FireSmart BC website
- BC Wildfire Prevention website
- First Nations' Emergency Services Society
- Programs FireSmart Canada
- Wildfire Preparedness Guide
- First Nations Forestry Council
- BC Wildfire Service
- BC Government - Wildfire
- Emergency Management in BC
- Destination BC - Emergency Preparedness
- Educational Messages Desk Reference (the National Fire Protection Association)
- BC Hydro - be prepared for emergencies

Legislation and Planning

- BC Emergency and Disaster Management Act
- BC Local Government Act
- BC Open Burning and Smoke Control Regulations
- BC Wildfire Act and Regulations
- Forest and Range Practices Act
- Professional Governance Act
- Fisheries Act
- Species at Risk Act
- Migratory Birds Convention Act

Development Considerations

- Information on Development Permit Areas is available at FireSmart BC - Development Considerations
- Additional guidance on land use planning tools and strategies for the Wildland-Urban Interface include the American Planning Association's PAS Report 594 Planning the Wildland-Urban Interface (2019), which available at no charge through the association's website.
- The National Research Council (NRC) Wildland-Urban Interface Technical Committee has also published National Guide for Wildland-Urban Interface (WUI) Fires (2021); this guide provides guidance to Canadian local governments and First Nations on WUI land use planning and regulation implementation.

Interagency Cooperation

- FireSmart BC

Other agencies that may play a role in interagency cooperation:

- Indigenous Services Canada
  - Emergency Management Assistance Program (EMAP), which supports communities in accessing emergency assistance services. Will provide funding for communities to build resiliency, and prepare and respond to natural hazards
- First Nation Health Authority
  - Emergency Management Branch – ensures FN communities are effectively incorporated into emergency preparedness, prevention, response and recovery initiatives.
- First Nations Emergency Services Society
  - Emergency Management department provides community-based emergency management guidance, support, and assistance to BC First Nation communities.
  - Fire Services Department assists communities to increase level of fire protection
  - Forest Fuel Management Department liaises with governments and other agencies to assist with wildfire prevention activities.
- Emergency Management BC
  - BC Wildfire Service and Emergency Management BC (EMBC), along with several other Ministries and agencies, are working in close collaboration to provide First Nations training, equipment, and capacity support.

Cross-Training

- UNBC - Wildland Firefighting Training Certificate
- OH&S (06) - Fire Safety Planning & Systems
- FireSmart training courses
- Recognized British Columbia S-100 instructors

Emergency Planning

The following resources are available for reference and to assist with emergency planning:

- National guide for wildland-urban-interface fires - which provides guidance to Canadian local governments and First Nations on WUI land use planning and regulation implementation, as well as guidance on wildfire response preparedness planning.
- FireSmart BC Emergency Planning
- Emergency management in B.C. – which contains several valuable resources including fire services, education and toolkits, and preparedness and recovery information.

Vegetation Management

- The BCWS Fire and Fuel Management web page offers a number of tools that support fuel management planning and implementation and can be accessed here.
- Contact your local BC Wildfire Service Fire Centre office to learn more about, engage and collaborate on Landscape Zone vegetation management planning.
- FireSmart Guide to Landscaping
- Funding resources for fuel management treatments can vary from year to year as funding pots change over time. Current available funding opportunities can be initiated through conversation with First Nation Emergency Services Society (FNESS) prior to completion of treatments.

Appendix C Wildfire Threat Assessments

See attached Appendix C – Wildfire Threat Assessments for details.