Community Wildfire Resiliency Plan

City of Kelowna
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Submitted by:

B.A. Blackwell & Associates Ltd.
270 – 18 Gostick Place
North Vancouver, BC, V7M 3G3

Submitted To:

Tara Bergeson – Parks Department
1359 K.L.O. Road
Kelowna, BC V1W 3N8

REGISTERED PROFESSIONAL SIGN AND SEAL

RPF PRINTED NAME	
Bruce Blackwell	2073
DATE SIGNED	
June 29, 2022	
I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.	
Registered Professional Forester Signature and Seal	

ACKNOWLEDGEMENTS

EXECUTIVE SUMMARY

The Community Wildfire Resiliency Plan (CWRP) is the latest evolution in a comprehensive wildfire risk reduction initiative throughout the Province of British Columbia. A CWRP has its roots in the Community Wildfire Protection Plan (CWPP) framework, which was originally established in BC in response to the series of devastating wildfires in 2003. Since then, many communities in BC have continued to face an ever-increasing threat of wildfire, as the 2017, 2018, and 2021 fire seasons proved to be three of the most historically damaging seasons on record. CWRPs are currently being developed at many jurisdictional and geographic scales, and are individually tailored to address the needs of different communities in response to their size, their capacity, and the unique threats that they face. Despite these differences, the provincial goals of a CWRP remain the same and are founded in the seven FireSmart disciplines: Education, Legislation & Planning, Development Considerations, Interagency Cooperation, Cross-Training, Emergency Planning and Vegetation Management.

This CWRP will help to guide City Council, City staff, the Kelowna Fire Department, local residents, tourists, and stakeholders in becoming more resilient in the face of an ever-increasing wildfire threat. Recommendations for wildfire risk reduction initiatives that were made in the City of Kelowna's 2016 and 2011 CWPPs were revisited and progress was reviewed. Although achievements have been made, Kelowna continues to be exposed to a number of wildfire risks based on the natural environment and continued development into the wildland urban interface. While an improved Wildfire Development Permit process has assisted in reduction of forest fuels in the interface – including lands transferred to the City for park space – they do not currently provide for the quantification, mitigation, or management of grassland fuels. At the homeowner level, the dissemination and uptake of FireSmart programs throughout the City is low, which has frequently resulted in landscaping decisions that directly expose residents to fire hazards.

This CWRP provides an updated action plan to outline the most effective and realistic path forward to proactively protect the community, infrastructure, and natural landscape that the City of Kelowna is known for. Organized by the seven FireSmart disciplines, Table 1 below displays the key recommendations that form this action plan. The implementation of these recommendations will require a motivated and coordinated effort by multiple levels of government and stakeholders – which is a basic requirement for forming a strong and resilient community. As Kelowna is projecting substantial population growth in the immediate future and the wildfire environment is continually evolving, this CWRP should be updated within five years of adoption to capture changes in regulation, development and threat.

Table 1. The City of Kelowna's CWRP Prioritized Action Plan

Item #	Priority	Recommendation	Lead Agency	Timeframe
E1	High	**Create a FireSmart Coordinator position to oversee the delivery of a comprehensive FireSmart program.**	City of Kelowna (Parks Services, and / or Kelowna Fire Department)	1 year
E3	Moderate	**Promote FireSmart information and wildfire preparedness through social media and other outreach opportunities.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing
E4	High	**Promote FireSmart information and wildfire preparedness through television or radio advertisements.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing
E5	Moderate	**Host FireSmart workshop(s) for residents.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing (two workshops could be hosted in a 5-year timeline).
E6	Moderate	**Give FireSmart presentations in local schools.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department), School District 23	Ongoing
E7	High	**Engage directly with residents in priority neighborhoods to offer Home Ignition Zone assessments and deliver wildfire preparedness information.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing
E8	High	**As emergency evacuation plan(s) are completed, engage with residents to provide relevant emergency preparedness information.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department), RDCO	1-3 years (pending completion of evacuation planning)
E9	Low	**Engage with Kelowna Chamber of Commerce, Tourism Kelowna, and/or Destination BC to assess the potential feasibility of hosting a collaborative FireSmart campaign aimed at tourist audiences.**	City of Kelowna (Potential FireSmart coordinator, Parks Services, and / or Kelowna Fire Department), Destination BC, Tourism Kelowna	1-3 years
E10	Moderate	**Host FireSmart / wildfire preparedness booths at public events and/or festivals during the summer.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing (suggest participation in 2-3 events per season)

Item #	Priority	Recommendation	Lead Agency	Timeframe
E11	Moderate	**Promote uptake into the FireSmart Neighbourhood Recognition Program.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	3-5 years
E12	Moderate	**Install signage at locations of recent fuel treatments**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing
L1	Moderate	**Update the Urban Forest Management Strategy**	City of Kelowna (Parks Services), consultant support	1-2 years
L2	Moderate	**Adopt a standard for fuel management in parks and green spaces.**	City of Kelowna (Parks Services), consultant support	1-3 years
L3	Low	**In 2026, initiate an update of this CWRP.**	City of Kelowna (Parks Services), consultant support	5 years
L4	High	**Adopt the Wildfire DP Terms of Reference.**	City of Kelowna (Planning & Development)	1-3 years
L5	High	**The Wildfire DP should Include/incorporate the construction and major renovation of new single-family homes on existing lots into the Wildfire DP process'.**	City of Kelowna (Planning & Development)	3-5 years
L6	Low	**Implement the recommendations of the Non-Structural Flood Mitigation Resource Guide**	City of Kelowna	Ongoing
L7	Low	**Amend the Subdivision, Development & Servicing Bylaw (Bylaw #7900) to include a requirement for the installation of fire hydrants outside linear parks and natural area parks.**	City of Kelowna (Planning & Development, Parks Services)	1 year
D1	High	**Engage a qualified professional (such as a Local FireSmart Representative) to update or complete formal FireSmart assessments of critical infrastructure.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	3-5 years
D2	Moderate	**Use fire-resistant construction materials, building design and landscaping for all critical infrastructure when completing upgrades or establishing new structures**	City of Kelowna (Engineering, Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing

Item #	Priority	Recommendation	Lead Agency	Timeframe
D3	Moderate	**Develop a standard for early review of prospective parks locations at the neighborhood planning stage, by Kelowna Parks Services staff.**	City of Kelowna (Potential FireSmart Coordinator, Planning & Development, Parks Services, and / or Kelowna Fire Department)	3-5 years
D4	Moderate	**Assess the feasibility of purchasing easements around subdivision boundaries in order to install perimeter trails.**	City of Kelowna (Potential FireSmart Coordinator, Planning & Development, Parks Services, and / or Kelowna Fire Department)	3-5 years
I1	Moderate	**Collaborate with the MoF, BC Parks and BCWS to promote knowledge sharing about completed and ongoing wildfire risk reduction projects near Kelowna, and to strategize mid- to long-range planning for future adjacent treatment areas.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department, MoF, BC Parks, BCWS	1-3 years

Item #	Priority	Recommendation	Lead Agency	Timeframe
I2	Moderate	**Schedule regular meetings of members of the Community FireSmart Resiliency Committee (CFRC).**	City of Kelowna (all parties involved in CFRC)	Ongoing (at least one meeting annually)
I3	Moderate	**Through the CFRC meetings or another planning table, initiate and maintain regular information sharing meetings with RDCO staff, and other municipalities in the Central Okanagan.**	City of Kelowna, RDCO or other municipality staff as applicable.	Ongoing (at least one meeting annually)
I4	Moderate	**Engage with operators (e.g., BC Hydro, Fortis BC) to encourage completion of FireSmart assessments for privately owned critical or hazardous infrastructure.**	City of Kelowna, RDCO, private operators	1-3 years
I5	Moderate	**Engage with Indigenous communities to identify opportunities for collaboration related to community wildfire resilience initiatives.**	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing (at least one meeting annually)
C1	High	**Hold periodic multi-agency training exercises focused on interface wildfire incident response with BCWS and / or other mutual aid partners.**	Kelowna Fire Department	Ongoing (two in-person exercises could be held in a five-year timeframe)
C2	Moderate	**The Kelowna Fire Department should maintain and expand the annual interface wildfire training programs offered to its members, as well as continuing to support workshops and training days.**	Kelowna Fire Department	3-5 years

Item #	Priority	Recommendation	Lead Agency	Timeframe
C3	Low	**Attend the annual FireSmart conference.**	City of Kelowna (Kelowna Fire Department, Parks Services)	Ongoing
EP1	High	**Review back up power source options for all critical infrastructure.**	City of Kelowna (Kelowna Fire Department, Utilities)	1-3 years
EP2	High	**Complete and participate in regular testing of a wildfire incident pre-plan.**	City of Kelowna (Kelowna Fire Department, Parks Services	1-3 years
EP3	High	**Evaluate the utility of adopting an electronic emergency alert system for City of Kelowna residents that is deployable by City staff.**	City of Kelowna (all parties involved in CFRC), consultant support	1 year
EP4	High	**Complete a community water delivery assessment for suppression requirements across all four water purveyors.**	City of Kelowna (Utilities), utility providers, consultant support	1-3 years
EP5	Moderate	**Based on the results of the fire flow/water availability assessment, evaluate the utility of installing dry hydrants in natural areas and acquiring lake water compatible pumps to support suppression response in more isolated areas of the municipality.**	City of Kelowna (Kelowna Fire Department, Utilities), consultant support	1-3 years
Item #	**Priority**	**Recommendation**	**Lead Agency**	**Timeframe**
EP6	Moderate	**Identify municipal buildings, such as community centers or libraries, as clean air spaces and promote their use during occurrences of poor air quality.**	City of Kelowna, RDCO	1-3 years
EP7	High	**Evaluate the feasibility of obtaining a structural protection unit (SPU) for the City.**	City of Kelowna (Kelowna Fire Department), consultant support	1 year
EP8	High	**Review, update, and regularly revise a Total Access Plan.**	City of Kelowna (Kelowna Fire Department, Parks Services), BCWS, consultant support	1-3 years
EP9	High	**Complete a municipal evacuation plan, drawing on the outcomes of the RDCO evacuation planning process (in progress, to be completed 2022).**	City of Kelowna (Kelowna Fire Department, Parks Services), consultant support	1-3 years
V1	High	**Maintain or expand the current fuel treatment program, for both forest and grass fuels.**	City of Kelowna (Parks Services)	3-5 years (ongoing)
V2	Moderate	**Offer support for residents to dispose of flammable debris and vegetation from FireSmart landscaping initiatives on private property.**	City of Kelowna (Parks Services, potential FireSmart Coordinator)	Ongoing

| V3 | Low | **Continue to track information on completed fuel treatments within the City of Kelowna.** | City of Kelowna (Parks Services, potential FireSmart Coordinator) | Ongoing |
| V4 | Low | **Monitor treatment effects from the surface fuel reduction grazing trial in south Kelowna (scheduled for 2022).** | City of Kelowna, BCWS | 1-3 years |

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FREQUENTLY USED ACRONYMS

AOI	Area of Interest
BC	British Columbia
BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CFS	Community Funding and Support
CI	Critical Infrastructure
CIIZ	Critical Infrastructure Ignition Zone
CRI	Community Resiliency Investment
CWPP	Community Wildfire Protection Plan
CWRP	Community Wildfire Resiliency Planning
DP	Development Permit
EMBC	Emergency Management British Columbia
FBP	Fire Behavior Prediction System
FESBC	Forest Enhancement Society of British Columbia
FESIMS	Forest Enhancement Society Information Management System
FPA	Fire Protection Area
FSCCRP	FireSmart Canada Community Recognition Program
HIZ	Home Ignition Zone (also see Structure Ignition Zone)
HRVA	Hazard Risk and Vulnerability Analysis
KFD	Kelowna Fire Department
LRMP	Land and Resource Management Plan
MoF	Ministry of Forests
MOTI	Ministry of Transportation and Infrastructure
NDT	Natural Disturbance Type
PSTA	Provincial Strategic Threat Assessment
OCP	Official Community Plan
RDCO	Regional District of Central Okanagan
SWPI	Strategic Wildfire Prevention Initiative
UBCM	Union of British Columbia Municipalities
VAR	Values at Risk
WRR	Wildfire Risk Reduction
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

In August of 2003, the Okanagan Mountain Park fire consumed over 25,000 hectares of forest and park land and destroyed 239 homes on the southern edge of Kelowna, thrusting the City into a focal role regarding wildfire risk reduction efforts. In response to the 2003 fire and other devastating interface wildfires, the provincial government began directing funding towards community wildfire resiliency initiatives, which have allowed jurisdictions of all sizes to proactively address their unique vulnerabilities with creative solutions. The City of Kelowna has taken advantage of these initiatives and programs, having developed Community Wildfire Protection Plans (CWPP) in 2011 through Diamond Head Consulting and through B.A. Blackwell & Associates (Blackwell) in 2016.

Figure 1. Aerial view of the 2003 Okanagan Mountain Park Fire. (Photo courtesy of NASA/GSFC/METI/Japan Space Systems, and U.S./Japan ASTER Science Team)

Kelowna has used these CWPPs to take many productive strides toward reducing the threat of wildfire to the community, but the City's exposure to wildfire still remains extreme. Each fire season in recent years has threatened the landscapes and communities of the Okanagan Valley. Evacuation orders have become the norm for multiple communities, and structure losses have been witnessed as recently as August of 2021. An everchallenging climate, hazardous topography, and development trends that have seen growth extend further into the wildland urban interface (WUI) have put Kelowna in a difficult position. To continue addressing this challenge, Blackwell was retained by the City of Kelowna to develop this Community Wildfire Resiliency Plan (CWRP).

1.1 PLAN PURPOSE AND GOALS

The intent of this CWRP is to provide a realistic and actionable plan to guide the City of Kelowna's wildfire risk reduction initiatives through the next five years. Programs and efforts adopted through this plan will help form a foundation that can be carried forward in perpetuity to build a resilient community. While Kelowna's previous CWPPs have extensively defined the wildfire risk within the City and focused on fuel management initiatives at the stand and landscape level, this CWRP will largely focus on opportunities for increasing public awareness of this wildfire risk, increasing interagency connection, and emergency planning.

Future population growth, land use and policy decisions will guide the City in the coming years, and the importance of managing for resilience to wildfire cannot be understated. Tied to the seven FireSmart[1]

Canada disciplines, this CWRP will focus on the following strategies to provide for the future resiliency of Kelowna:

1. Establishing a more robust program of FireSmart education amongst City representatives and staff, residents, and tourists, and developing a City-led program to assist residents in performing mitigation activities.
2. Assessing current legislation, regulations, and community plans as they relate to wildfire preparedness in Kelowna.
3. Strengthening interagency and inter-departmental cooperation to better coordinate riskreduction efforts between multiple stakeholders within Kelowna, and with nearby communities.
4. Advocating for continual wildfire training within the Kelowna Fire Department (KFD), and for annual cross-training between the KFD, BC Wildfire Service (BCWS), City of Kelowna staff, and external emergency management personnel.
5. Assessing the current framework of emergency preparedness in Kelowna, and the robustness of pre-planning for small- and large-scale evacuations.
6. Expanding current vegetation management efforts within the City to include new management strategies to address grassland hazard.

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

1.2 CWRP DEVELOPMENT SUMMARY

The CWRP development process consisted of four general phases:

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

Meetings and interviews were planned to obtain information on wildfire risk mitigation initiatives currently in place or completed, review existing plans, policies, bylaws, and current resources, identify areas of concern and vulnerabilities, and to determine priorities and potential mitigation strategies. Members of the CFRC were consulted at the onset of the project planning phase via questionnaires, and

[1] FireSmart□ and the FireSmart logo are registered trademarks of Partners in Protection Association (PiP)

on an ongoing basis throughout plan development. The CFRC was integral in the CWRP review process and approval.

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

2) Review of Relevant Plans and Legislation

All municipal, regional, and provincial bylaws, policies, plans, and guidelines were reviewed, and sections within that are relevant to the CWRP are identified (Section 2: Relationship to Other Plans and Legislation).

3) Identification of Values at Risk and Wildfire Risk Assessment

The identified values at risk are described in Section 3.2: Values at Risk and concepts of wildfire threat and risk are elaborated on in Section 4: Wildfire Risk Assessment. The wildfire threat to Kelowna was assessed through a combination of the following approaches:

- Natural fire regime and ecology
- Provincial Strategic Threat Analysis
- Local wildfire threat assessment.

4) Developing an Action Plan

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

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

The CFRC should continue to meet periodically, as needed to coordinate the fulfillment of this report's recommendations (consider annually or bi-annually, before or during the fire season – per recommendation in Table 17).

SECTION 2: RELATIONSHIP TO OTHER PLANS AND LEGISLATION

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

2.1 LOCAL AUTHORITY EMERGENCY PLAN

The Central Okanagan Regional Emergency Plan is administered by the KFD, and is the guiding plan for emergency response and post-emergency recovery. This is a comprehensive plan shared with the City of West Kelowna, Peachland, Lake Country, and Westbank First Nation. Revised in 2020 and tested with evacuations in the 2021 wildfire season, this plan defines operations of the Emergency Operations Centre (EOC), and addresses local states of emergency and emergency communications. No additional Kelowna-specific emergency and/or evacuation plans exist, and this emergency plan will not be directly discussed any further in this CWRP.

2.2 LINKAGES TO OTHER CWPPS/CWRPS

As mentioned earlier, this CWRP is the latest evolution of Kelowna's 2011 CWPP and the 2016 CWPP. The assessments and methodologies from those two reports have been considered throughout the development of this document. The work put into those documents has helped pave the way for mitigation efforts within and adjacent to Kelowna; ten years after the 2011 CWPP, the successes and challenges of implementing the various recommendations has formed the backbone for this CWRP action plan.

Within the City of Kelowna boundaries, there are a number of parks and natural areas managed by the Regional District of Central Okanagan (RDCO). A CWPP was developed for these areas in 2020 by Cabin Forestry, and will be referenced later in this document. As well, communities and regional districts up and down the Okanagan Valley have completed CWPPs, and a wide array of land managers (municipalities, First Nations, government, forest licensees, conservation groups etc.) have performed a variety of measures to become more resilient to wildfire. Recommendations in this CWRP should be assessed through a synergistic approach with neighbouring jurisdictions where appropriate.

2.3 CITY OF KELOWNA 2040 OFFICIAL COMMUNITY PLAN

Early in 2022, Kelowna adopted a new Official Community Plan (OCP) which will shape the growth, land uses, and policies that will guide the City through the year 2040.

The OCP was developed around 10 foundational "Pillars", three of which have direct relevance to the purpose and goals of this CWRP.

1. *Stop planning suburban neighbourhoods.*
    I. *Limiting urban sprawl into suburban and rural neighbourhoods will limit population in these wildland urban interface (WUI areas.*
2. *Protect and restore our environment*
    I. *Protecting Kelowna's land, water, and air, and restoring ecosystems to a healthier state.*
3. *Take action on climate*
    I. *Becoming a more resilient community in the face of a changing climate.*

Table 2 provides a summary of objectives and policies from Kelowna's 2040 OCP that are directly relevant to this CWRP and have influenced our decisions. These objectives and policies will be frequently referenced in the remainder of the document.

Table 2. Summary of objectives and policies from Kelowna's 2040 OCP, with relevance to this CWRP.

OCP Objective	Relationship to CWRP
Objective 7.1: *Enable the completion of planned suburban neighbourhoods.*	• Policy 7.1.1 supports the review of, and amendments to, adopted Area Structure Plans for Suburban neighbourhoods. • *Area Structure Plans are long range planning documents that provide direction for development. Review and amendment of Area Structure Plans are tools the City can use to influence the course of development in the wildland urban interface in Kelowna.*
Objective 7.2: *Design suburban neighbourhoods to be low impact, context sensitive and adaptable.*	• Under this objective, policies note various ways neighborhood design should adapt to local features, such as steep slopes and proximity to the Kelowna airport. • *Wildfire hazard and proximity wildland-urban interface are additional local features to which suburban neighborhoods should be adapted.*
Objective 7.10: *Maintain connectivity for emergency response and evacuation.*	• Under this objective, policies mandate that road networks in suburban areas be designed to allow for multiple points of access/egress to facilitate emergency response and to support evacuations. • *Emergency response and evacuation planning are two key components of effective community wildfire resilience planning.*

Objective 9.2:	• Under this objective, policies support applying an indigenous lens when undertaking 2040 OCP

OCP Objective	Relationship to CWRP
Strengthen the relationship with the syilx/Okanagan people through initiatives and processes to advance and support reconciliation.	implementation actions, and recognizing documents such as Calls to Action from the Truth and Reconciliation Commission and the United Nations Declaration on the Rights of Indigenous People when implementing OCP actions. • *Information sharing, consultation, and cooperation with First Nations is supported by FireSmart interagency cooperation.*
Objective 9.3: *Develop diverse partnerships to advance complex social planning issues and increase community wellbeing.*	• Under this objective, policies support pursuing government partnerships, involving multiple stakeholders, engaging the community, and coordinating programs regionally. • *Interagency Cooperation is one of the seven FireSmart disciplines.*
Objective 10.1: *Acquire new parks to enhance livability throughout the city.*	• Policy 10.1.3 requires that priority future park locations of future are those that are connected to existing parks, and provide lake or linear park access. • Policy 10.1.6 requires that in phased developments, future parks and open space networks should be identified and confirmed through zoning. • Policy 10.1.15 aims to ensure that wildfire hazards are mitigated prior to property acquisition by Kelowna and that they have adequate access for maintenance and linear trails. • Policy 10.1.20 mandates avoiding locating public utilities in parks and natural open spaces unless overall public benefit and environmental management best practices can be demonstrated. • *Policies relating to park acquisition strategy and park location selection, and policy to ensure wildfire hazards are mitigated prior to park acquisition by Kelowna are strategies aligned with FireSmart development considerations.*
Objective 10.2: *Ensure parks and public spaces are connected to each other and accessible for all citizens.*	• Policy 10.2.10 aims to optimize trail locations next to developments for multiple objectives, including to provide a wildfire fuel break. • *Policy 10.2.10 aligns with FireSmart development considerations.*

Objective 10.5: *Encourage partnerships to acquire and deliver parks and public spaces.*	• Policy 10.5.2 supports the acquisition of RDCO lands to protect sensitive ecosystems. • *Land acquisition will introduce new areas for which Kelowna should consider pre-existing wildfire risk and FireSmart vegetation management strategies.*
Objective 12.8: *Support the community to prepare for and become resilient to the impacts of climate change.*	• Policies discuss the creation of a centralized warning system, supporting emergency planning and preparedness, preparing the community to be 72-hour reliant, and creating strong neighbourhoods.

OCP Objective	Relationship to CWRP
	• *Policies align with considerations for FireSmart emergency planning*
Objective 12.11: *Increase resilience to extreme weather events.*	• Policy mandates a 'build back better' approach in the event of catastrophic loss that might occur in the event of natural disasters • *Best practices for FireSmart development considerations, and FireSmart legislation and planning is to increase resilience proactively, before catastrophic loss.*
Objective 14.2 *Protect and expand a healthy and viable urban forest.*	• Under this objective, policies support expanding and enhancing the city's tree canopy, planting indigenous vegetation, prioritizing trees in development, and connecting habitat through the urban forest. • *Best practices of FireSmart vegetation management are to follow guidelines or recommendations of a Qualified Professional to plant fire-friendly shrubs and vegetation, manage them appropriately, or remove where necessary to reduce hazard.*
Objective 14.5 *Protect and restore environmentally sensitive areas from development impacts.*	• Policies mandate that developments be designed to avoid environmentally sensitive areas, and that existing vegetation must be retained. Objective 14.5.2 notes that vegetation loss may be necessary as recommended by a qualified professional, to minimize risk, in the Wildfire Development Permit area. • *Objective 14.5.2 aligns with FireSmart vegetation management best practices.*

Objective 15.1 *Reduce wildfire risk to health and safety of the public, property and infrastructure.*	• Policy 15.1.1 requires that subdivision design incorporates wildfire hazard reduction considerations. • Policy 15.1.2 requires access and egress to at-risk neighborhoods be improved. • Policy 15.1.3 states that property-owners should be encouraged to use FireSmart principles on their properties. • Policy 15.1.4 mandates management of forest fuels, using new & conventional technologies, and traditional syilx/ Okanagan knowledge, in accordance of a changing climate. • Policy 15.1.5 requires development permits for subdivision, rezoning, or construction of multi-family, commercial, institutional and industrial development. • Policy 15.1.6 requires Guided by a QP through a wildfire hazard assessment, perform fuel mitigation on properties transferred to the City prior to the transfer. • *Policies align with multiple FireSmart disciplines.*

2.4 LOCAL BYLAWS

There are a number of local and regional bylaws that have relevance to future wildfire risk reduction efforts within the City of Kelowna. Table 3 below demonstrates a summary of these bylaws (and covenants) and remarks on their implications toward ideas within the CWRP.

Table 3. Summary of local and regional bylaws that have direct relevance to the CWRP.

Bylaw	Description and Relationship to CWRP
Fire and Life Safety Bylaw City of Kelowna, No. 10760	Any burning for the purpose of fuel reduction or hazard abatement on private or public property requires a permit and is only permitted when the venting is >65 ('Good' begins at 55).
Tree Protection Bylaw City of Kelowna, No. 8041	Historically has placed prohibitions on cutting trees within hazardous condition Development Permit Areas, unless permitted. Recommended actions within a wildfire hazard assessment supersede the prohibitions of this bylaw.
Smoke Control Regulatory Bylaw RDCO, No. 773	Administered as part of the RDCO Regional Air Quality Program – a joint initiative that Kelowna is a part of. This bylaw does not consider burning for forest fuel management or fire hazard reduction to be "open burning", and therefore does not apply. Burning under an approved community wildfire risk reduction framework can be performed under the relaxed setbacks of the Open Burning Smoke Control Regulation (OBSCR) Division 2.

Bylaw 7900 Subdivision, Development and Servicing Bylaw	• road requirements (widths, lengths allowed, etc.) • landscaping • hydrant requirements
Bylaw 6000 Zoning Bylaw	• landscape requirements

2.5 OTHER LOCAL PLANS

The City of Kelowna has a number of other local plans in place that have influenced the historic and current efforts of risk mitigation within the City, and that have also shaped the recommendations of this CWRP. These plans are developed collaboratively by a number of different City departments, with considerable input from the general public.

Table 4. Summary of additional local plans with direct relevance to the CWRP.

Plan Type	Description and Relationship to CWRP		
Area Structure Plans (ASP)	Linked to the OCP, these Plans guide new developments within Suburban Neighbourhoods and/or Rural Lands. The following ASPs have already been endorsed by Council:		
	Gallagher's Canyon Golf Resort (2001)	Quail Ridge (1994)	Kirschner Mountain (2002)
	Southwest Okanagan Mission (Neighbourhood 1 – 1996)	Highway 33 East (1997)	Bell Mountain (2003)
Plan Type	**Description and Relationship to CWRP**		
	Southwest Okanagan Mission (Neighbourhood 1 – 2000)	Glenmore Highlands (2000)	Vintage Landing (2005)
	Southwest Okanagan Mission (Neighbourhood 3 – 2007)	Central Park Golf Course (2000)	University South (1997)
	Tower Ranch (1993)	Canada Lands (2000)	North Clifton (2014)
Neighbourhood Plans	• Linked to the OCP, these Plans guide the development and redevelopment (generally) within the Urban Centers and Core Areas.		

Servicing Plan and Transportation Master Plan	• These two plans are being developed in conjunction with the OCP. The 2040 Servicing Plan is the plan for construction of new services or expansion of existing services to accommodate new growth. and was not available for viewing at the time of writing the CWRP. • The recently endorsed 2040 Transportation Master Plan will not be reviewed in depth. • One exclusive note references wildfires and/or evacuations, and is supportive of recommendations within this CWRP: • With reference to suburban neighbourhoods: "An entire neighbourhood may have a single point of access which creates challenges for emergency response and evacuation." The idea of proactively considering emergency access routes alternative to public streets is discussed.
2017 Kelowna Integrated Water Supply Plan (Strategic Value Solutions Inc.)	• Provides a plan for Kelowna to develop a city-wide integrated water system, that is more sustainable, clean, and cost-effective in response to projected population growth. • Phase 1 of this plan continues to be implemented, and has involved the construction of five new pump stations and reservoirs.

2.6 LINKAGES TO HIGHER LEVEL PLANS AND LEGISLATION

Adopted in 2001, the Okanagan-Shuswap Land and Resource Management Plan (LRMP) provides guidance for land management decisions on Crown land within the Plan boundaries. While the majority of lands within the boundaries of this CWRP are not designated as Crown land, the objectives, ministerial orders, and non-legal planning objectives of the LRMP should be reviewed, considered, and addressed through any physical wildfire risk reduction planning. Where there are adjacent and/or overlapping values at risk, spatially explicit ministerial orders, or other notable values as defined by the LRMP, the appropriate land manager should be consulted and a collaborative solution should be developed. Table 5 will review some of the key management goals of the LRMP, and other high-level plans and legislation that are relevant to this CWRP.

Table 5. Higher Level Plans and Relevant Legislation

Plan/Legislation	Description and Relationship to CWRP

Regional District of Central Okanagan Clean Air Strategy (2015)	• Multi-jurisdictional effort to define strategies to meet set goals regarding air quality in the region. Of the sixteen strategies outlined, two are directly related to prescribed fire and fuel management:
	    o Aim to eliminate smoke from burning (agriculture, forestry, and land clearing)
	    o Aim to eliminate backyard burning in residential neighbourhoods

Okanagan-Shuswap LRMP	• Provides a framework to manage a variety of landscapes throughout the Okanagan-Shuswap corridor, to provide for a diversity of timber and non-timber forest values. Land management objectives and strategies within the LRMP that surround the municipal boundaries of Kelowna should continue to be considered within City limits. • On multiple occasions, the LRMP references the potential use of prescribed burning to achieve both fire hazard mitigation and ecosystem restoration objectives, especially in the NDT4a (grassland site series).
Okanagan-Shuswap Natural Resource District (DOS) Fire Management Plan[1]	• The Draft DOS 2021-2023 Fire Management Plan (FMP) outlines values at risk on the landscape as they relate to wildfire suppression tactics. These values are ranked between four themes: human life and safety, property and critical infrastructure, high environmental and cultural values, and resource values. • Outputs of the FMP and any resulting fire analyses may form the basis of a wildfire being categorized as a "managed wildfire". Due to the extremely high number of values at risk within the AOI of this CWRP, it is increasingly unlikely that an active wildfire would not be actioned aggressively.
Open Burning Smoke Control Regulation (OBSCR)	• Updated in recent years, the OBSCR now provides a special division for open burning under a plan for community wildfire risk reduction. When burning under an approved WRR framework, the setbacks for open burning have been relaxed. • Changes to the OBSCR have not yet been factored into the City's bylaw for open burning (Bylaw No. 10760).
BC Parks Management Plans and Fire Management Plans	• Existing plans for nearby provincial parks include the Myra Bellevue Park Management Direction Statement (2005), which describes values, management issues, and priority objectives. • BC Parks may publish park Management Plans or Fire Management Plans for provincial parks adjacent to the City of Kelowna (e.g. Okanagan Mountain Provincial Park and Myra Bellevue Provincial Park). Management Plans provide detailed strategic management direction. Fire Management Plans provide the same, but specifically deal with wildfire management issues.

SECTION 3: COMMUNITY DESCRIPTION

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[1] Draft of the 2021-2023 Okanagan-Shuswap FMP shared by Brent Lipinski, Land & Resource Coordinator, Okanagan-Shuswap Natural Resource District (Sept. 30 2021).

Kelowna is a rapidly expanding city in one of the most wildfire-prone valleys in BC. According to the 2021 census, Kelowna's population has grown to 144,576, a 13.5% increase since 2016. [3] Kelowna's population is expected to increase by approximately 45,000 people and be over 180,000 by 2040. As such, the 2040 OCP targets approximately 73% of this future growth to take place within its five Urban Centres and the surrounding Core Area in the form of infill and redevelopment in existing neighbourhoods. The remainder of the city's growth would take place in suburban neighbourhoods and the Gateway district (which includes the UBCO campus) with little to no growth in rural lands. Much of the suburban neighbourhoods, Gateway and rural lands are characterized by hillsides, steep slopes and forested lands identified as wildfire interface areas.

Figure 2. Cityscape of Kelowna, looking south from downtown. The unforested band of hillside in the far background is a result of the 2003 Okanagan-Mountain Park fire. Photo Credit: Shawn Talbot Photography.

Outdoor attractions and recreation are a major draw to Kelowna for tourists, many of which are from outside BC. Published in 2020, a study by InterVISTAS on the economic impact of tourism in the greater Kelowna area estimated that 70% of tourists came from outside BC.[4] This points to a need to continue to protect the natural areas within and adjacent to the City, and ensure that wildfire preparedness, prevention, and mitigation measures are communicated to more than the permanent population. Statistics regarding home type and home ownership in Table 6 below also illustrate a requirement to build a resilience to wildfire among the rental population and across a breadth of home types.

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[3] Statistics Canada, Census Profile 2021 Census of Population

[4] 2018 Economic Impact of Tourism in the GKA, InterVISTAS, 2020. Accessed from: https://assets.simpleviewinc.com/simpleview/image/upload/v1/clients/kelowna/Tourism_Kelowna_Economic_Impact_of_Tour ism_Industry_2018_FINAL_22Sep2020__24db9ad2-b5d2-4b46-b1d7-1cc49a5f19e5.pdf

Table 6. Socio-economic statistics from Kelowna.

Metric	Value		Data Source
Population Age Distribution	Age 0-14 Age 15-65 Age 65+	13% 67% 20%	2021 Environics Analytics Estimates
Direct Economic Impact; Tourism Sector (2018)	Same-Day Visitors	400K	Report: 2018 Economic Impact of Tourism in the Greater Kelowna Area, InterVISTAS.
	Overnighters	2.1M	
	Visitor Spending	$443M	
	Jobs	9,210	
	GDP	$642M	
	Economic Output	$1.4B	
Homes Owned and Rented	Single-detached Homes	50%	Stats Canada, 2016 Census
	Homes owned	67%	
	Homes rented	33%	
Residence Type	Single-detached	44%	2021 Environics Analytics Estimates
	Semi-detached / row	13%	
	Apartment (low and high)	42%	
	Other dwelling type	1%	

3.1 AREA OF INTEREST AND WILDLAND-URBAN INTERFACE

The Area of Interest (AOI) for this CWRP has been restricted to the municipal boundary of Kelowna. The 2011 and 2016 CWPPs provided assessments and recommendations that included a 3-km and 2-km buffer around this boundary, respectively. While this CWRP does not extend past city boundaries, an approaching or internal wildfire will not stop at city boundaries either. It should be recognized that collaborative initiatives and decision-making with adjacent land-owners – be it private, Crown, or within a Provincial Park– is a requirement for resilience. Within the AOI, the majority of land is privately owned (77%). Large portions of private land will be developed in the future but are presently comprised of continuous tracts of forested land. Municipally-held land makes up 13.4%. First Nations lands are recorded under 'Unknown', 'First Nation', and 'Federal' ownership categories and total 270.4 ha.

Table 7. Land ownership area within Kelowna.

Land Ownership	Hectares
Crown Agency	34
Crown Provincial	732

Federal	277
Municipal	2665
Mixed Ownership	31
First Nation	2
Private	15376
Unknown	772
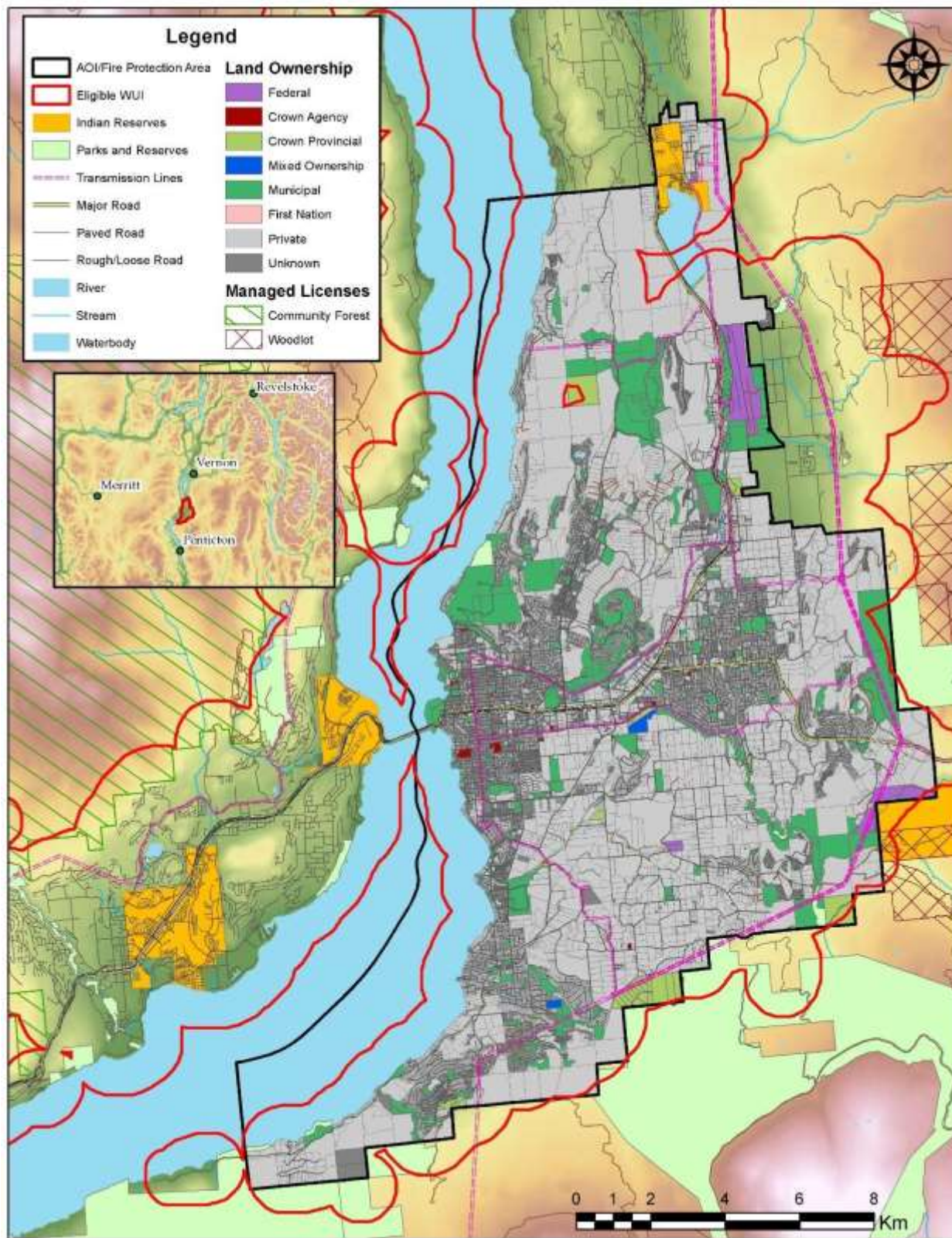
Map 1. Overview map of the Kelowna CWRP Area of Interest.

3.2 VALUES AT RISK

Building community wildfire resilience within Kelowna is an end-goal that begins with first providing for the safety and well-being of individual residents and tourists, and then expanding this focus to the neighbourhood and community level. Different efforts are required at different spatial and temporal scales in order to build this resilience, but will always be based on the same foundational values: human life, property, infrastructure, cultural and natural environment.

The following sections identify and describe key critical infrastructure and values-at-risk across several different categories. They summarize information made available since the 2016 CWPP draft, as well as information on newly constructed critical infrastructure unlisted in the last report. A spatial inventory of critical infrastructure was available at the time of drafting this report, while it was not available in 2016, and it provides an extensive explanation of the City's resources. After analysis, the most relevant valuesat-risk are reviewed in the following sections and were used in the development of recommendations in Section 5: FireSmart Principles.

Critical infrastructure, for the purposes of this report, is defined as assets that are essential for the functioning of government and society, namely, water, food, transportation, health, energy and utilities, safety, telecommunications and information technology, government, finance, and manufacturing.[5] Within municipal boundaries, critical infrastructure provides essential services to the City on a day-today basis and during emergency situations. Protection of critical infrastructure and values at risk during a wildfire event is an important consideration for emergency response effectiveness, ensuring that coordinated evacuation can occur if necessary and that essential services can be maintained or restored quickly in an emergency. Critical infrastructure is shown on Map 2, Map 3, and Map 4.

3.2.1 EMERGENCY RESPONSE, PUBLIC SERVICES, AND COMMUNICATIONS

Emergency response services and infrastructure have not changed significantly since the 2016 CWPP. This includes police, fire department, ambulance service, and emergency operations centre structures, which continue to meet capacity for the City. The KFD maintains their pre-existing seven fire stations throughout the City, with Station 1 functioning as the EOC for the RDCO; however, the 2016-2030 Kelowna Fire Department Strategic Plan identifies the need to build another station in the future. Additionally, in the 2016 CWPP, nine communication towers were identified; however, there are currently several dozen privately operated cell towers throughout the AOI.

As a result of the expanded critical infrastructure inventory held by Kelowna, an increased number of critical infrastructure sites have been identified in this CWRP, compared to the 2016 CWPP. The critical infrastructure inventory includes assets operated by public (federal, provincial, and local governments)

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

and private agencies. Map 2 shows privately operated critical infrastructure, and cultural values at risk within the AOI, from the critical infrastructure inventory. Map 3 shows emergency response and government facilities, operated by Kelowna local government, as well as provincial and federal agencies. Map 4 shows the locations of public and privately operated utilities, as well as high environmental values (species at risk occurrences).

3.2.2 ELECTRICAL POWER

No substantial changes have occurred to electrical service for the City since 2016. Distribution still occurs through a network of wood pole transmission and underground infrastructure supplied by Fortis BC. The vulnerability of wood pole distribution lines to fire remains present.

There are several Fortis facilities to support the electric and gas pipeline distribution network within the AOI. No major FortisBC projects are planned which overlap the municipality, although upgrades are planned for a facility at Cary Road & Enterprise Way. A BC Hydro transmission line expansion project is planned for West Kelowna, with completion proposed in 2025. Although this will not service residences within the AOI, it will support resiliency for the neighboring community, with indirect benefits to Kelowna.

3.2.3 WATER AND SEWAGE

Water supply in Kelowna is split into four different water providers: the City of Kelowna Water Utility, Glenmore-Ellison Improvement District (GEID), Rutland Waterworks, and Black Mountain Irrigation District. In 2018 the SE Kelowna Irrigation District (SEKID) was dissolved, and the City Utility has taken over the assets and liabilities of water supply to SEKID customers. These four providers utilize a variety of high-elevation reservoirs and dams, groundwater supply and lake-water supply through both gravityfed and pumping systems. Where improvements are currently being made to residential water supply (i.e., through the replacement of SEKID), presumably the supply for fire protection needs will also be increasingly sustainable, as these flows will continue to be supplied through the existing irrigation systems. As of 2019, proactive wildfire risk reduction initiatives began to take place in both the GEID and BMID, under the guidance and funding of the Forest Enhancement Society of BC (FESBC).[6]

Water Provider	Water Source & Systems	Comments

City Utility	**Okanagan Lake** Intakes: Poplar Point, Eldorado, Cedar Creek, Swick Road. Multiple pump stations and reservoirs.	**Recent upgrades/construction:** Jean Road reservoir and pump station; Stellar Drive pump station; Dall Road reservoir; Adams reservoir; Hayes reservoir; Lower Crawford pump station. **Vulnerabilities:** Power supply for the pump stations and/or ability to provide backup power sources (e.g. generator).

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[6] Collaboration in the Okanagan is Reducing Wildfire Risk to Water Supply: https://www.fesbc.ca/collaboration-in-the-okanagan-is-reducing-wildfire-risk-to-watersupply/

Water Provider	Water Source & Systems	Comments
GEID	**Reservoirs:** Postill, Bulman, South and McKinley. Five groundwater wells.	**Vulnerabilities:** Catastrophic wildfire in the GEID watershed. Long-term drought situations.
BMID	**Reservoirs:** Belgo, James Lake, Graystone Lake, Fishhawk Reservoir. Gravity fed through Mission Creek – distributed.	**Vulnerabilities:** Catastrophic wildfire in the BMID watershed. Affected by the 1162-hectare Derrickson Lake wildfire (2021). Long-term drought situations.
Rutland Waterworks	14 groundwater wells.	**Vulnerabilities:** Catastrophic wildfire in the source watershed. Long-term drought situations.

3.2.4 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders, and protecting hazardous values from fires is important to preventing interface fire disasters. Anywhere combustible materials, explosive chemicals, gas, or oil is stored can be considered a hazardous value. These values were not specifically identified in the 2016 CWPP. Hazardous values may be considered critical infrastructure (e.g., rail yards, landfills, chlorine storage for water treatment) or they may not (e.g., large, non-essential propane facilities).

In Kelowna, important hazardous values-at-risk include: airport rescue and firefighting services at the Kelowna International Airport that are stationed to respond to incidents within or close to the airport; water treatment facilities that use chlorinators and store large quantities of chlorine; and rail yards and transmission lines that intersect the municipality as they pose a risk of ignition. In areas zoned for industrial use there are also propane storage lots, fueling stations and other commercial operations with potentially hazardous materials stored on site. In areas zoned for agricultural use within the municipality, pesticide, fuel and chemical stored on site are hazards.
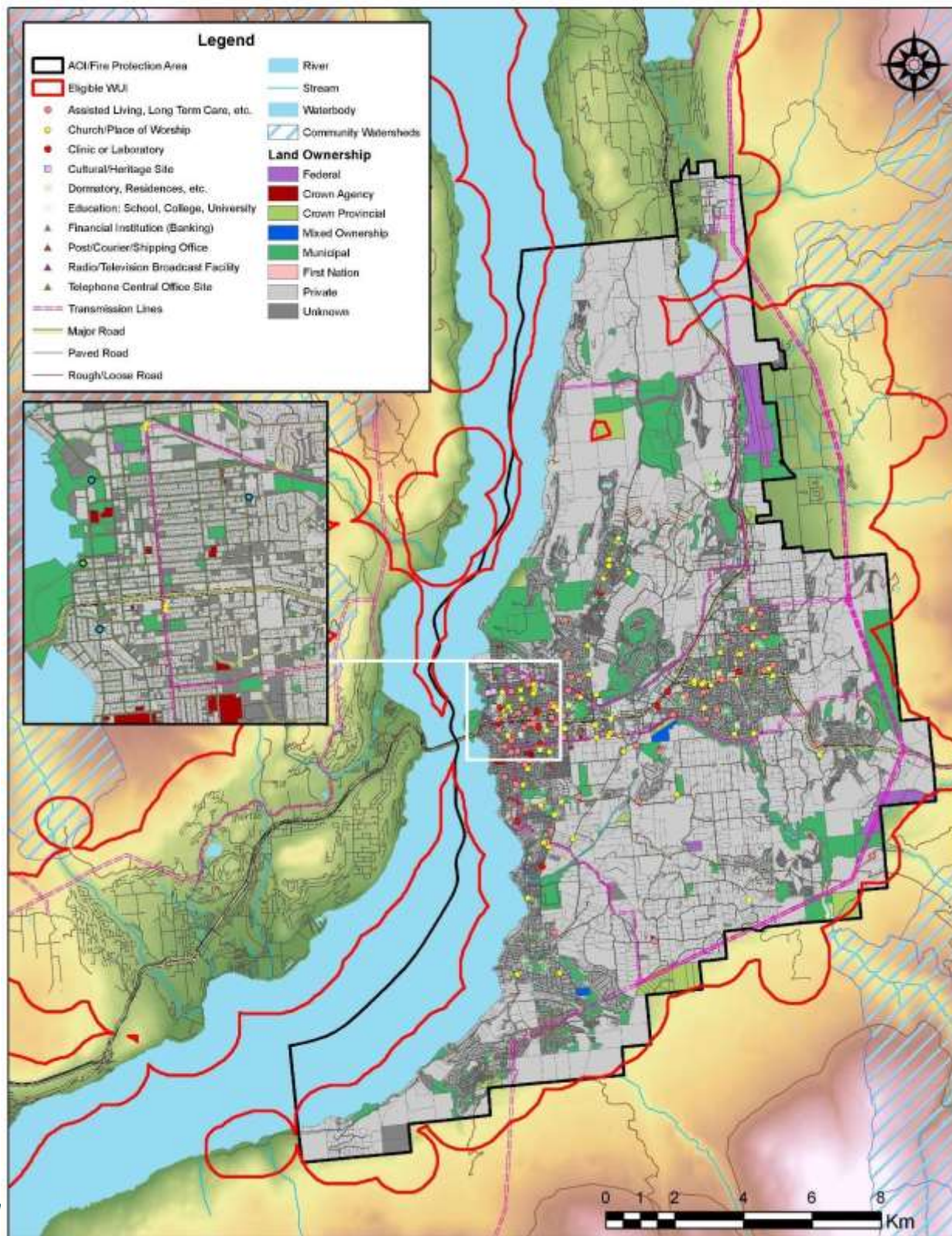
2. Location of critical infrastructure (private assets and cultural / heritage values) in Kelowna

Map
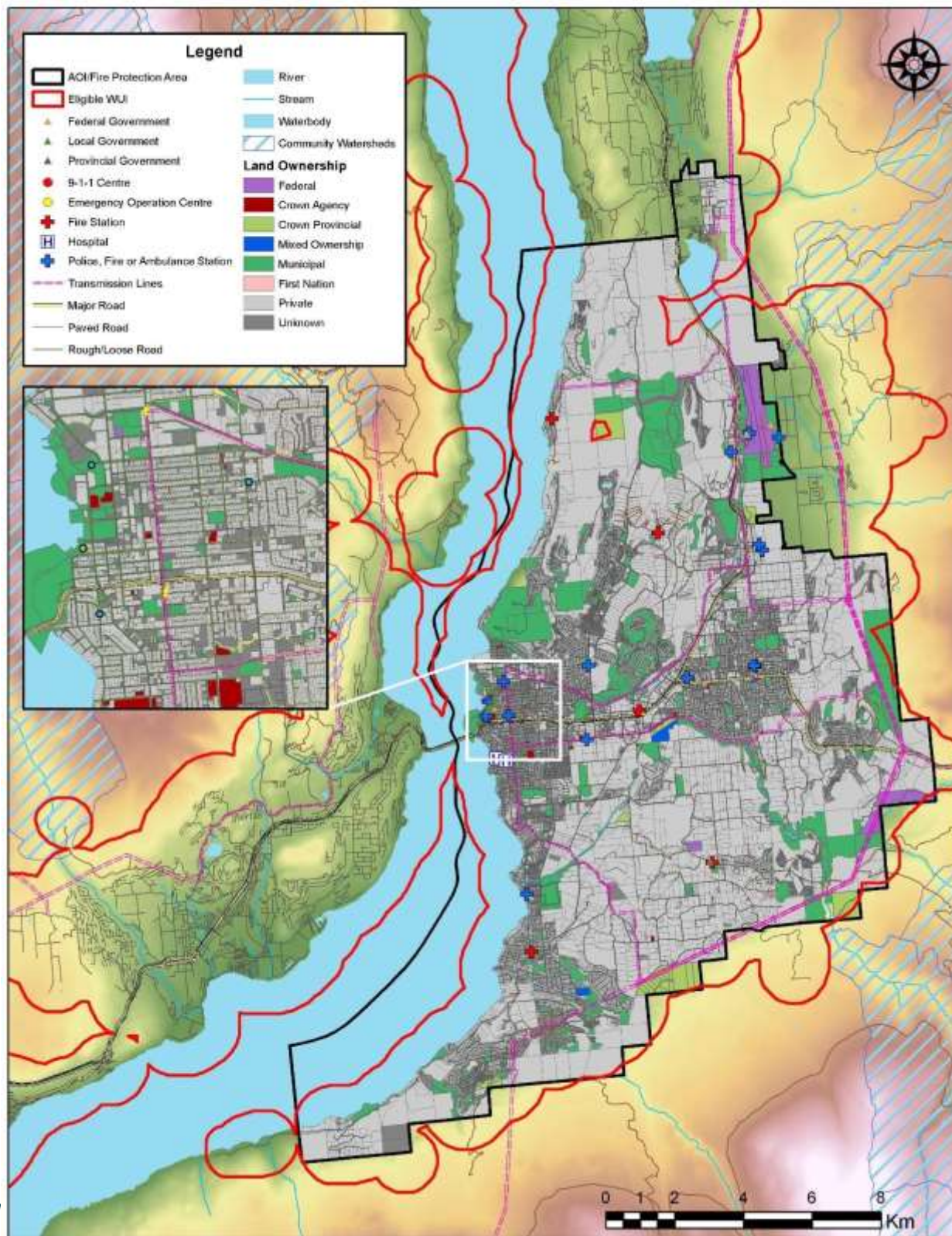
3. Location of critical infrastructure (emergency response and government facilities) in Kelowna.

Map
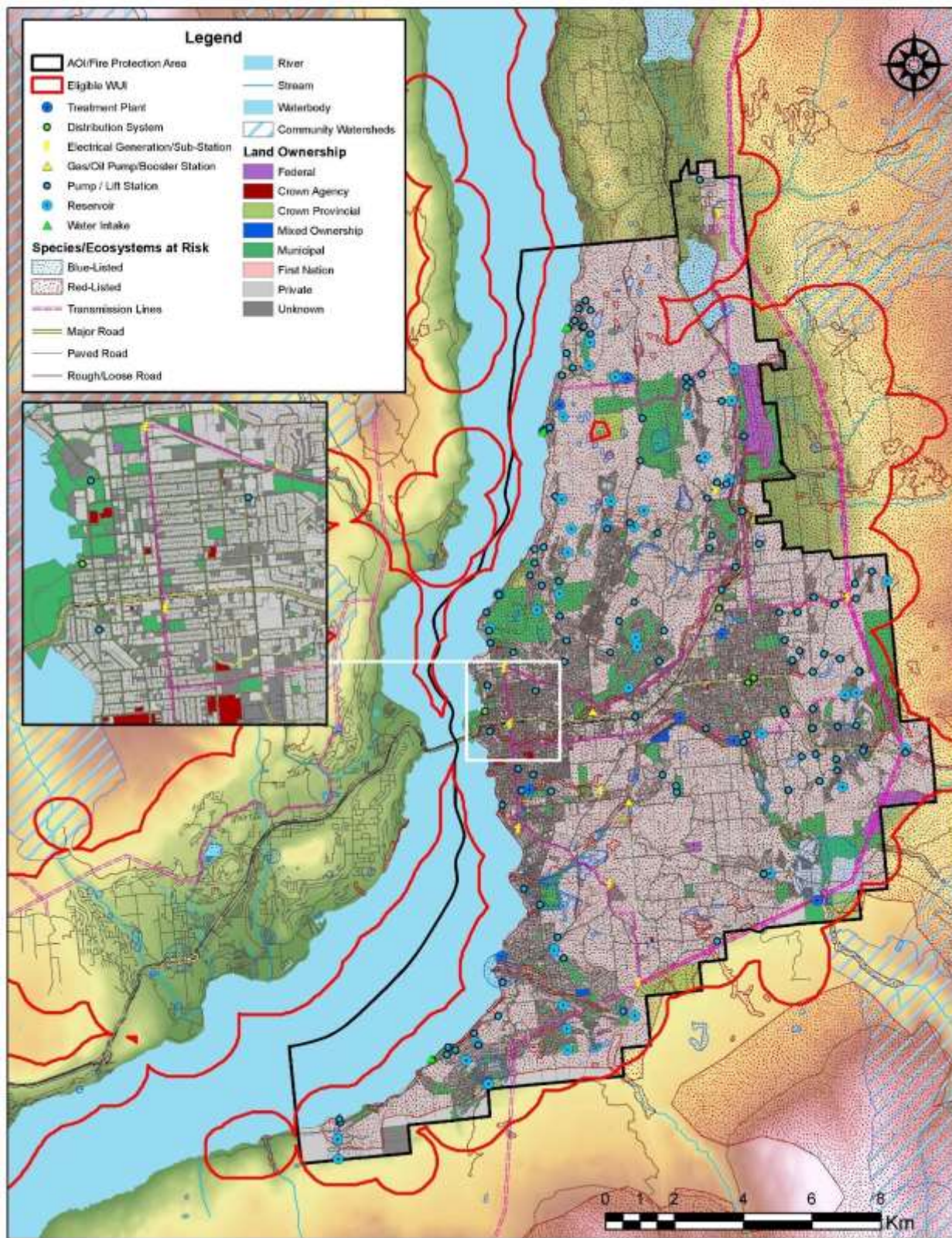
4. Location of critical infrastructure (public and private utilities) and species at risk occurrences in Kelowna.

Map

3.2.5 CULTURAL VALUES

The City of Kelowna has recognized government buildings and galleries as cultural and heritage sites that are values at risk, including buildings that are part of the University of British Columbia's Okanagan campus. Cultural values have the potential to be impacted by wildfire through physical damage or alteration. Wildfire suppression techniques have the potential to disturb unidentified archaeological sites. If cultural values are inventoried and identified as sensitive sites, the possibility of protection and accommodation of these features in a wildfire incident is increased.

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

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

3.2.6 HIGH ENVIRONMENTAL VALUES

The 2016 CWPP identified 8 occurrences of red-listed species and 12 occurrences of blue-listed species. A survey of publicly available species at risk data identified 30 occurrences of species or ecological communities at risk, shown in the table below.

Table 8. Species or Ecological Communities at Risk in Kelowna.

Scientific Name	Common Name	Category	BC List
Ardea herodias herodias	Great Blue Heron, Herodias Subspecies	Vertebrate Animal	Blue
Azolla mexicana	Mexican Mosquito Fern	Vascular Plant	Blue
Berula erecta	Cut-leaved Water-parsnip	Vascular Plant	Blue

Scientific Name	Common Name	Category	BC List
Chrysemys picta pop. 2	Painted Turtle - Intermountain - Rocky Mountain Population	Vertebrate Animal	Blue
Coluber constrictor	North American Racer	Vertebrate Animal	Blue
Distichlis spicata - Hordeum jubatum	Alkali Saltgrass - Foxtail Barley	Ecological Community	Blue
Efferia okanagana	Okanagan Efferia	Invertebrate Animal	Red
Eleocharis engelmannii	Englemann's Spike-rush	Vascular Plant	Blue
Euderma maculatum	Spotted Bat	Vertebrate Animal	Blue
Gonidea angulata	Rocky Mountain Ridged Mussel	Invertebrate Animal	Red
Juncus balticus - Carex praegracilis	Baltic Rush - Field Sedge	Ecological Community	Red
Juncus balticus - Potentilla anserina	Baltic Rush - Common Silverweed	Ecological Community	Red
Lindernia dubia var. dubia	Yellowseed False Pimpernel	Vascular Plant	Blue
Marsilea vestita	Hairy Water-clover	Vascular Plant	Blue
Megascops kennicottii macfarlanei	Western Screech-owl, Macfarlanei Subspecies	Vertebrate Animal	Blue
Melanerpes lewis	Lewis's Woodpecker	Vertebrate Animal	Blue
Pituophis catenifer deserticola	Gopher Snake, Deserticola Subspecies	Vertebrate Animal	Blue
Populus tremuloides / Symphoricarpos albus / Osmorhiza berteroi	Trembling Aspen / Common Snowberry / Mountain Sweet-cicely	Ecological Community	Red
Populus tremuloides / Symphoricarpos albus / Poa pratensis	Trembling Aspen / Common Snowberry / Kentucky Bluegrass	Ecological Community	Red
Populus trichocarpa - Pseudotsuga menziesii / Acer glabrum - Symphoricarpos albus	Black Cottonwood - Douglas fir / Douglas Maple - Common Snowberry	Ecological Community	Red
Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus sericea	Black Cottonwood - Douglas-fir / Common Snowberry - Red-osier Dogwood	Ecological Community	Red
Populus trichocarpa / Symphoricarpos albus - Rosa spp.	Black Cottonwood / Common Snowberry - Roses	Ecological Community	Red

Puccinellia nuttalliana - Hordeum jubatum	Nuttall's alkaligrass - Foxtail Barley	Ecological Community	Red
Recurvirostra americana	American Avocet	Vertebrate Animal	Blue
Reithrodontomys megalotis	Western Harvest Mouse	Vertebrate Animal	Blue
Salix amygdaloides	Peach-leaf Willow	Vascular Plant	Blue
Schoenoplectus acutus - deep marsh	Hard-stemmed Bulrush Deep Marsh	Ecological Community	Blue
Spea intermontana	Great Basin Spadefoot	Vertebrate Animal	Blue
Taxidea taxus	American Badger	Vertebrate Animal	Red
Typha latifolia - marsh	Common Cattail Marsh	Ecological Community	Blue

3.2.7 OTHER RESOURCE VALUES

The AOI overlaps portions of provincial parks which extend outward into continuous tracts of forested area beyond the municipality's borders. This includes Myra Canyon Park, and Okanagan Mountain Park. These parks encompass networks of trails that see significant use by hikers, mountain bikers, dogwalkers, and other recreational traffic.

Other values in the Kelowna WUI that are at risk from the impacts of wildfire include agricultural, vineyard, and tourism operations. Each of these are affected by unstable conditions created by growing fires, as well as other adverse environmental conditions such as smoky skies that impact outdoor activities and commercial product.

SECTION 4: WILDFIRE RISK ASSESSMENT

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

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

$$\textbf{\textit{Risk = Consequence × Probability}}$$

Where:

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

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

Probability is the likelihood of fire occurring in an area and that area's ability to ignite, spread, and consume organic material in the forest – its *wildfire threat*.

Wildfire threat is driven by three major components of the wildfire environment:

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

4.1 WILDFIRE ENVIRONMENT

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

4.1.1 TOPOGRAPHY

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

As detailed in Table 9, the majority of the City of Kelowna is located on slopes less than 20%, which typically see a normal rate of wildfire spread. 9% of the municipality is likely to experience an increased rate of spread, 5% a high rate of spread, and 1% a very high rate of spread. While there are some slopes within the municipality that exceed a 60% grade, they primarily occur over small areas difficult to detect on a landscape-level mapping tool.

Table 9. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of WUI	Fire Behaviour Implications
<20%	85%	Very little flame and fuel interaction caused by slope, normal rate of spread.
20-30%	9%	Flame tilt begins to preheat fuel, increase rate of spread.

30-45%	5%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
40-60%	1%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	0%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

When slope percentage is considered in context with a value's slope position, the possibility of increased fire behaviour for that value can change dramatically. For example, a value located in the upper third of a steep slope (>40%) is at high risk from a fire approaching from below due to the momentum and speed the fire can gather. Table 10 summarizes the fire behaviour implications for slope position. Residential developments in Kelowna are located at all positions due to the rolling topography of the area, however the most concerning locations are those that will see increased, fast or extreme rate of spread. These are found in the upland suburban areas.

Table 10. Slope Position of Value and Fire Behaviour Implications.

Value Position on Slope	Fire Behaviour Implications
Bottom of Slope / Valley Bottom	Impacted by normal rate of spread.
Mid-slope (bench)	Impacted by increased rate of spread. Position on a bench (broken slope) may reduce preheating near the value.
Mid-slope (continuous)	Impacted by high rate of spread; continuous slope allows for pre-heating of fuels uphill.
Upper 1/3 of slope	Impacted by extreme rate of spread. Continuous slope allows for pre-heating of fuels uphill; at risk for large continuous fire run.

4.1.2 FUEL

Private property comprises the majority of the land parcels within the municipality, and while it is beyond the scope of this report to quantitatively assess fuel loading on private land, it was anecdotally observed as a major risk factor. Fuel loading on private property includes both native (e.g., ingrown thickets of trees, mature trees with overhanging branches, some flammable conifer shrubs) and nonnative vegetation (e.g. grasses, flammable conifer shrubs). Vegetation on private property is further discussed in Section 5.7 and 5.1; however, the extent and continuity of this vegetation between homes, over large areas, creates a neighborhood-level fuel loading hazard.

On City-owned medians and rights-of-way in many areas of the municipality, a primary concern is flashy grass fuels. Grass fuels may be present in treed areas, if widely spaced trees and open canopies allow for a thick grassy understory to develop (e.g. areas typed as 'C-7' in Map 5 and Table 11), and open spaces with no trees. In general, the fuel types considered most hazardous in terms of fire behaviour and

spotting potential are high-density conifer forests (e.g. areas typed as 'C-3' in Map 5 and Table 11). A forest with both deciduous and coniferous trees can also be considered hazardous, depending on the proportion of conifers within the forest stand (e.g. areas typed as 'M-1/2' in Map 5 and Table 11). An area with no trees, purely composed of grasses and some shrubs, can often support a rapidly spreading grass or surface fire capable of damage or destruction (e.g. areas typed as 'O1-a/b' in Map 5 and Table 11).

Continuous tracts of forest adjacent to the municipality also present a risk. The dry forest ecosystems that comprise the outer portions of the municipality and extend into the interface area have historically been characterized by frequent, low- and mixed-severity fire regimes (see Section 4.2 Wildfire History), which periodically eradicate sapling and seedling regeneration within the stand. Due to the nature and management of much of this area (e.g., provincial park, Crown land, and private property) there has been suppression of the natural disturbance regime allowing conifer ingrowth and stand densities to increase. Recently, there have been multiple fuel management projects aimed at fuel reduction in some of these areas, particularly along the south slopes of the municipality.

In addition to the continuous tracts of forest adjacent to the municipality, the forested areas on the east side of Okanagan Lake also presents increasing risk to Kelowna neighborhoods. Depending on conditions, a wildfire burning in forests on the east side could loft embers over Okanagan Lake to lakeshore neighborhoods in Kelowna. Lakeshore neighborhoods in Kelowna are located as close as 2.5 km from the east side. The east side of the lake is comprised of smaller communities interspersed amongst large, continuous areas of Crown Provincial land.

The area and distribution of these different forest and vegetation types has been recorded in a provincewide fuel type spatial data layer, maintained by BC Wildfire Service. This spatial data layer uses the Canadian Forest fire Behaviour Prediction System's fuel type classification, which details sixteen different forest and vegetation types and their characteristic fire behaviour under defined conditions.[2] Fuel type updates and corrections were made to the fuel type spatial data layer for this CWRP. Fuel type updates and corrections were also made to the fuel type layer for the 2016 CWPP and as a result of this recent update, few changes were required. Overall, the fuel types identified and mapped in the 2016 CWPP are similar to the fuel types identified and mapped in this CWRP. Fuel types found within the municipality are shown on Map 5, and Table 11 below.

Table 11. Fuel types present in Kelowna's WUI.

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

Fuel Type	Description	Area (ha)	% Of Eligible WUI
C-3	Mature forest with trees growing at moderate densities, and crowns separated from the ground	77	<1%
C-7	Open, uneven-aged forest, crowns separated from the ground except in thickets, grass & herbs in understorey	5,118	20%
D-1/2	Deciduous trees growing at moderate densities	426	2%
M-1/2	Mature forest with a mix of both deciduous and coniferous trees.	94	<1%
Non-fuel		11,228	43%
O-1a/b	Grass with sparse or scattered shrubs, long grass and woody debris	4,519	17%
Water		4,713	18%
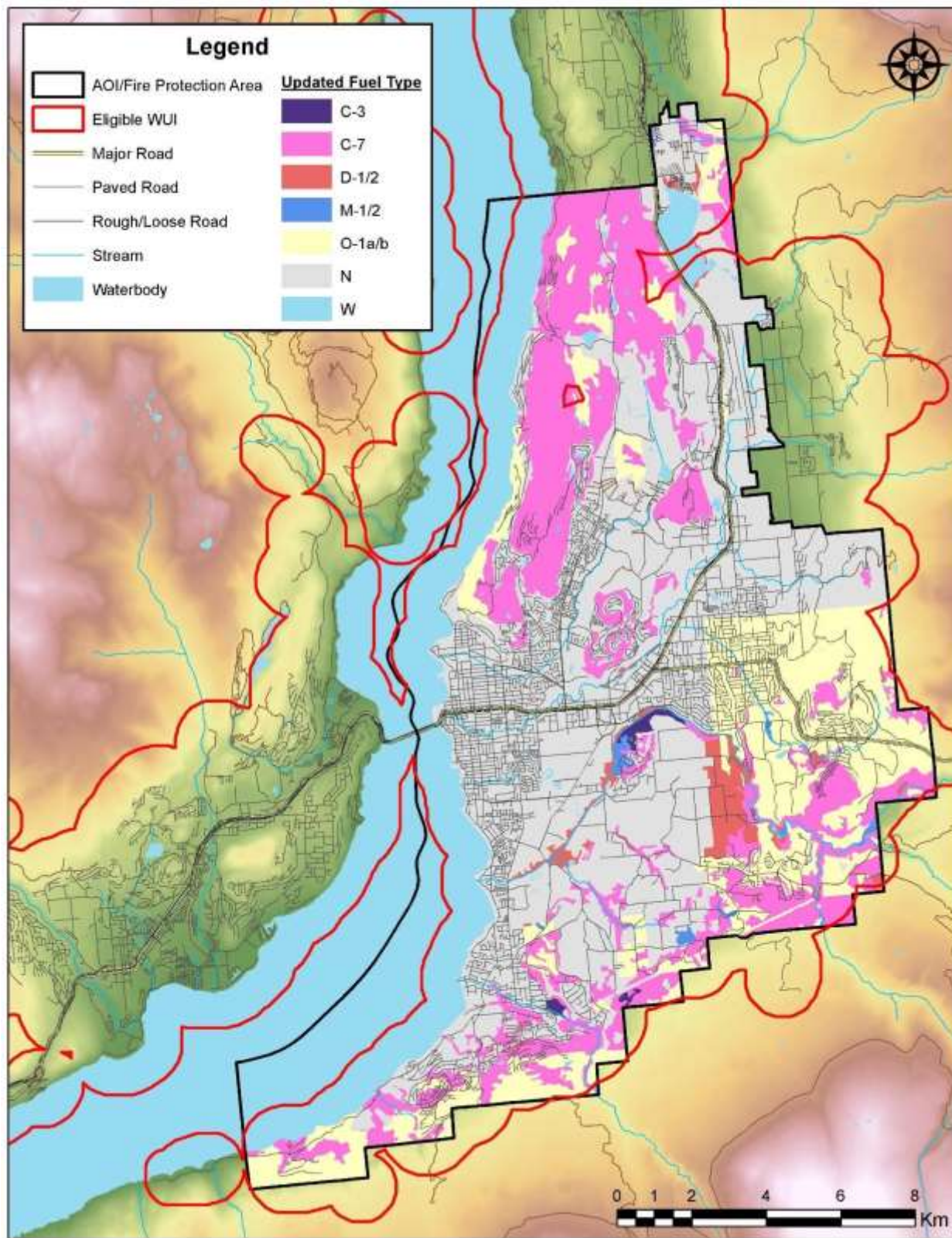
Map 5. Fuel types present in Kelowna's WUI.

4.1.3 WEATHER

The Biogeoclimatic Ecosystem Classification (BEC) system[8] is a provincial classification that divides the province into patterns of climatic envelopes, or zones. BEC zones are associated with unique climate attributes and Natural Disturbance Type regimes. The predominant disturbance agent considered in the Natural Disturbance Types is fire, although other critical disturbance agents are factored into the system.

The area overlapping the City of Kelowna is dominated by the Ponderosa Pine Very Dry Hot subzone – the driest, and in the summer the warmest, forested zone in BC (see Table 12). Similar to other communities situated in the Okanagan Valley bottom, the climate in Kelowna is dry, semi-arid, with low precipitation accumulations year-round. As a result, high and extreme danger class days are common – weather is a driving factor of wildfire in the municipality.

The area encompassing the municipality is characterized by Natural Disturbance Type 4. Natural Disturbance Type 4 represents ecosystems which normally experience frequent, low-intensity fires. Lowintensity fires occur when understory vegetation (grasses and shrubs), and woody debris is burned, but little mortality is sustained to mature plants and trees. Historically, in Natural Disturbance Type 4 ecosystems, these low-intensity fires likely occurred every 4 to 50 years. Many low-intensity fires occurred naturally, through lighting strike ignition. However, traditionally, Indigenous communities in the Okanagan area widely used controlled, low-intensity burns to manage the open forest and grassland ecosystems of their traditional territories.[9]

Table 12. BEC zones, subzones, and variants found within the WUI

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
PP xh: Ponderosa Pine, Very Dry Hot	NDT4	22,179.77	91.17%
IDF xh: Interior Douglas-fir, Very Dry Hot	NDT4	2148.31	8.83%

An important component of local weather that contributes to wildfire threat is the pattern of wind speed and timing observed throughout the fire season. High winds are common, as winds move up the lake; winds are generally weaker in the winter, and peak during the fire season. Gust speeds of 50 km / hour are not uncommon, and are generally recorded in the late afternoon or evening, overlapping with the hottest part of the day. Direction can switch diurnally during the fire season as well, with lowerspeed, southerly breezes more common during the morning, switching to northwesterly gusts in the

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

[9] Sylix – Okanagan Nation Alliance. 2022. *Prescribed Burns.* https://www.syilx.org/projects/prescribed-burns/
afternoon. Wind speed patterns were reviewed using data from the BC Wildfire Service, and more details are presented in Appendix A-3: Fire Spread Patterns.

Fire danger class days were analyzed in the 2016 CWPP and are presented again below. The general trends and patterns are the same and continue to support the assertion presented in the past CWPP iterations that *for about four months of the year in the summer, there is a high risk of a significant wildfire event* (June, July, August, September).

Modelling for Canada and western North America predicts that climate warming is expected to increase the frequency of fires and increase fire severity trends that have already been identified in recent years.[3,4,5] At the local level, climate projections predict trends that will increase the risk of a longer wildfire season, with a higher number of high and extreme fire danger class days throughout.[6] Key climate projections for the Okanagan include the following:

- **Considerably hotter summers**, with the number of days above 30°C expected to increase from 6 per year (historically) to 22 days per year by the 2050s.
- **Summer is expected to remain the driest season, and become drier**, with 23% less precipitation expected in the summer by the 2080s.
- **Historically rare and extreme heat events will become commonplace,** as the annual hottest daytime highs will be as warm as extreme 1-in-20 hottest day temperatures of the past.
- **Shifting seasons,** where the winter "season" is expected to shorten while the summer "season" will lengthen, with warmer annual temperatures.
- **Increased precipitation across all seasons except summer,** with an average increase during spring and autumn months of 17% by the 2080s

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

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

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

[6] Regional District of North Okanagan, Regional District of Central Okanagan, and Regional District of Okanagan Similkameen. (2020). *Climate Projections for the Okanagan Region.*
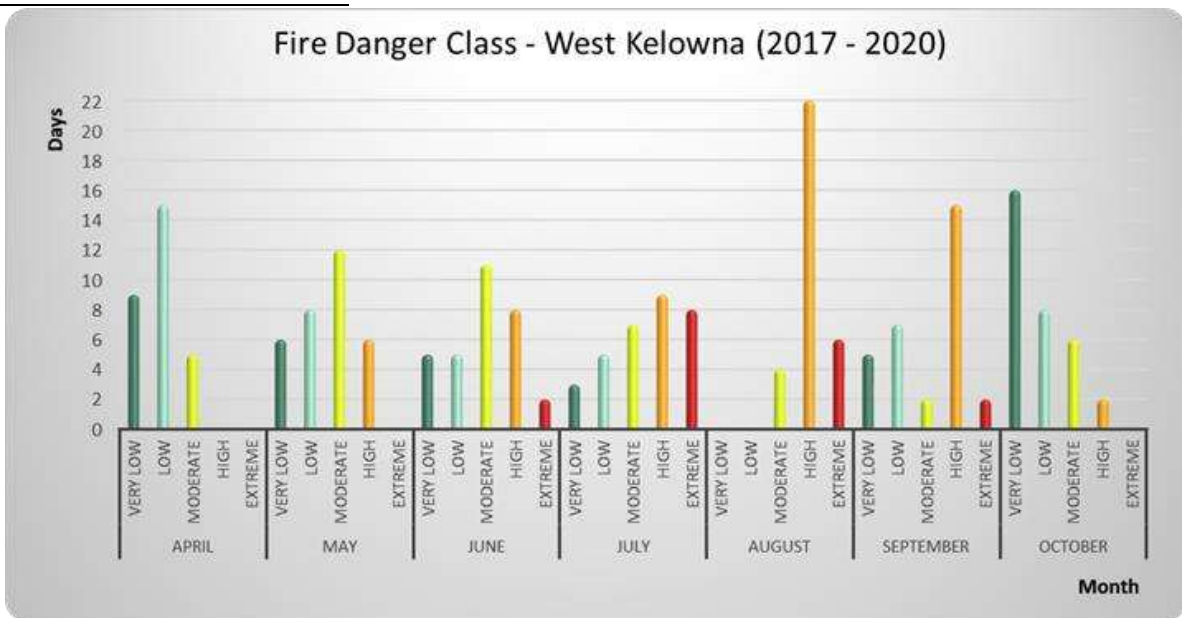
Figure 3. Average number of danger class days during the fire season for Kelowna (data obtained from the closest weather station, located in West Kelowna).

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
PP xh : Ponderosa Pine, Very Dry Hot	NDT4	2,148.31	91.17%
IDF xh : Interior Douglas-fir, Very Dry Hot	NDT4	22,179.77	8.83%
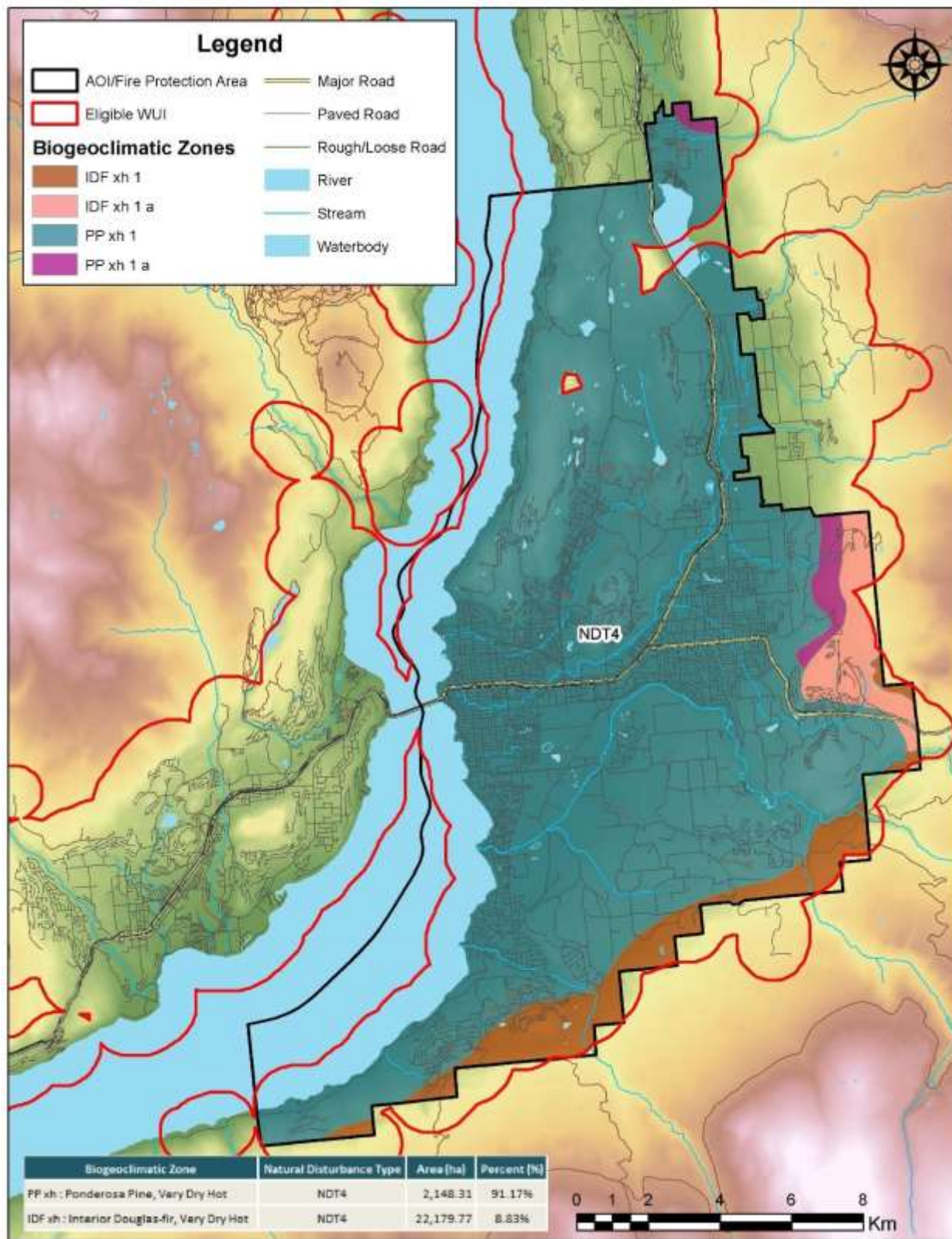
6. Biogeoclimatic zones and natural disturbance types in Kelowna.

4.2 WILDFIRE HISTORY

Kelowna is situated in a semi-arid climate, in ecosystems where frequent, low- to mixed-severity, standmaintaining fires naturally occur and are part of healthy ecosystem processes. However, as a result of widespread fire suppression throughout the 20th century and a recent series of weather and forest health disturbances linked to climate change, wildfire events have become larger and more destructive. Climate change projections for the Okanagan predict longer, hotter summers, with a higher frequency of intense heat events, factors that increase the risk of more frequent and more severe wildfires.

Multiple significant wildfire seasons have occurred impacting the province, the Okanagan and Kelowna since the last CWPP was written. The most recent wildfire season in 2021 was precipitated by an extreme heat dome event in late June, on the heels of a warm and dry spring, particularly for the Okanagan region. Over 8700 square kilometers of BC burned, which represents the third highest in BC's history. The Okanagan experienced particularly severe impacts, with several large wildfire events and wildfire complexes occurring, including: White Rock Lake (833 sq. km), Mount Law (9.8 sq. km), Brenda Creek (8.24 sq. km) and the Okanagan Complex (308 sq. km); a combination of three fires burning in close proximity). The RDCO Emergency Operations Centre, hosted in Kelowna, was activated for over two months throughout the summer to address these fires.

As well, between 2016 and 2020, two of the worst wildfire seasons in BC history occurred. Provincial fire suppression costs of the 2017 fire season exceeded $650 million, more than 65,000 people were evacuated and over 1.2 million hectares of land burned. The area burned in 2017 was unfortunately surpassed the next season in 2018, when more than 1.3 million hectares burned. Record breaking temperatures and clusters of lightning strikes were major contributors to the severity of that season.

Map
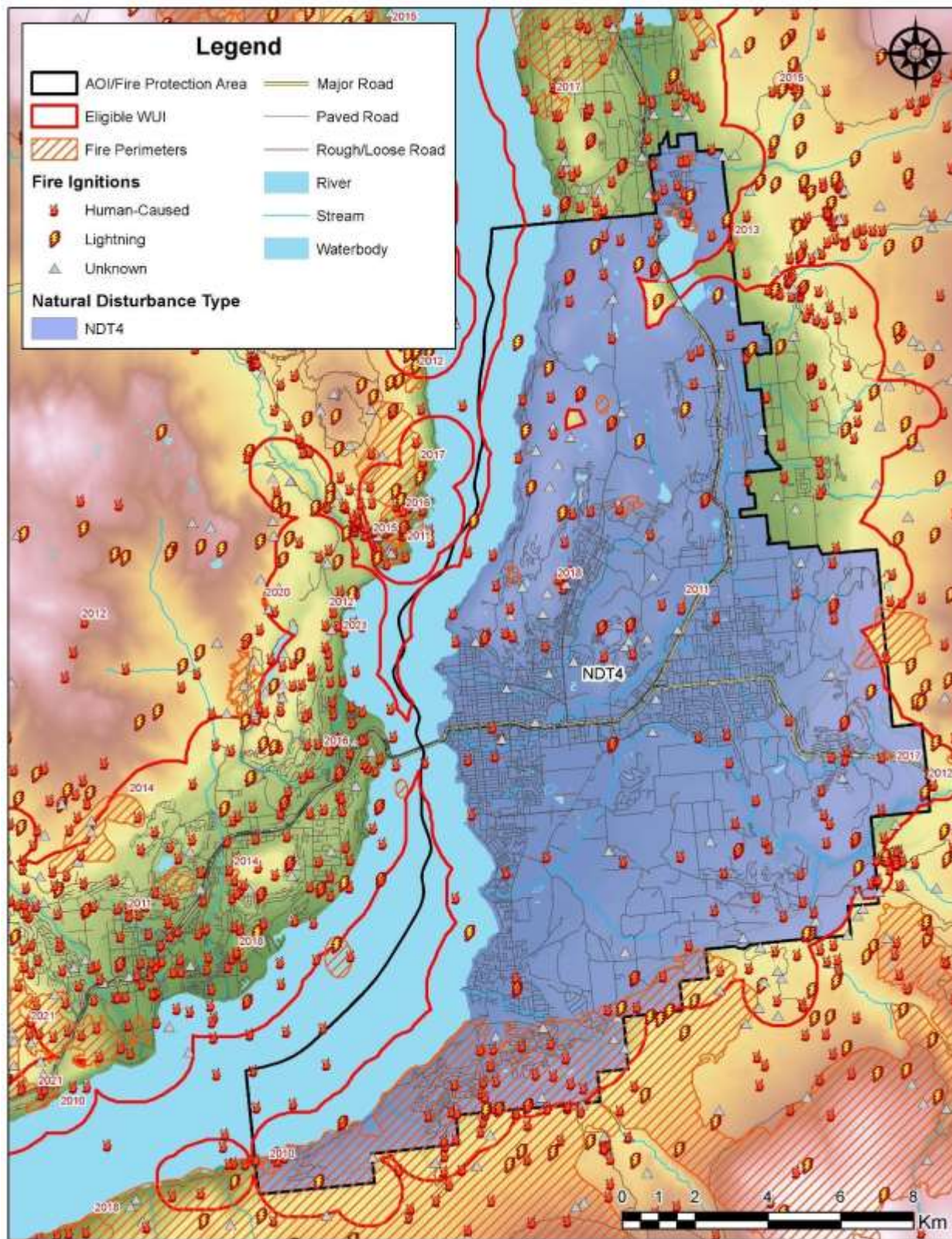
7. Natural disturbance regimes and historical fire ignitions & perimeters (1950-2021), within the WUI.

4.3 LOCAL WILDFIRE THREAT

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

- *Fuel type attribute assessment* – ground-truthing/verification and updating as required to develop a local fuel type map (Appendix A-1: Fire Risk Threat Assessment Methodology, Map 5).
- *Consideration of the proximity of fuel to the community* – recognizing that fuel closest to the community usually represents the highest hazard (Appendix A-2: Proximity of Fuel to the Community).
- *Analysis of predominant summer fire spread patterns* – using wind speed and wind direction during the peak burning period using ISI Rose(s) from BCWS weather station(s) (Appendix A-3: Fire Spread Patterns).
- *Consideration of topography concerning values* – slope percentage influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill (Section 4.1.1 - Topography).
- *Stratification of the WUI* – according to relative wildfire threat based on the above considerations, other local factors, and field assessment of priority wildfire risk areas.

It is important to note that the Local Wildfire Threat Assessment analyses **apply only to the government-owned land base within the municipality** (i.e., Provincial Crown land and Municipal land). However, the context this information provides can support the identification of priority areas for emergency management planning and preparedness on nearby private properties.

4.3.1 WILDFIRE THREAT CLASS ANALYSIS

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

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

Map

- <u>Moderate</u>: Developed and undeveloped land that will support surface fires that are unthreatening to homes and structures;

- <u>High</u>: Landscapes or stands that provide continuous forested fuels that will support candling, intermittent crown or continuous crown fires. These landscapes are often steeper slopes, rough or broken terrain and/or south or west aspects. High polygons may include high indices of dead and downed conifers; and

- <u>Extreme</u>: Continuous forested land that will support intermittent or continuous crown fires.

The results of the wildfire threat class analysis are shown on Map 7.
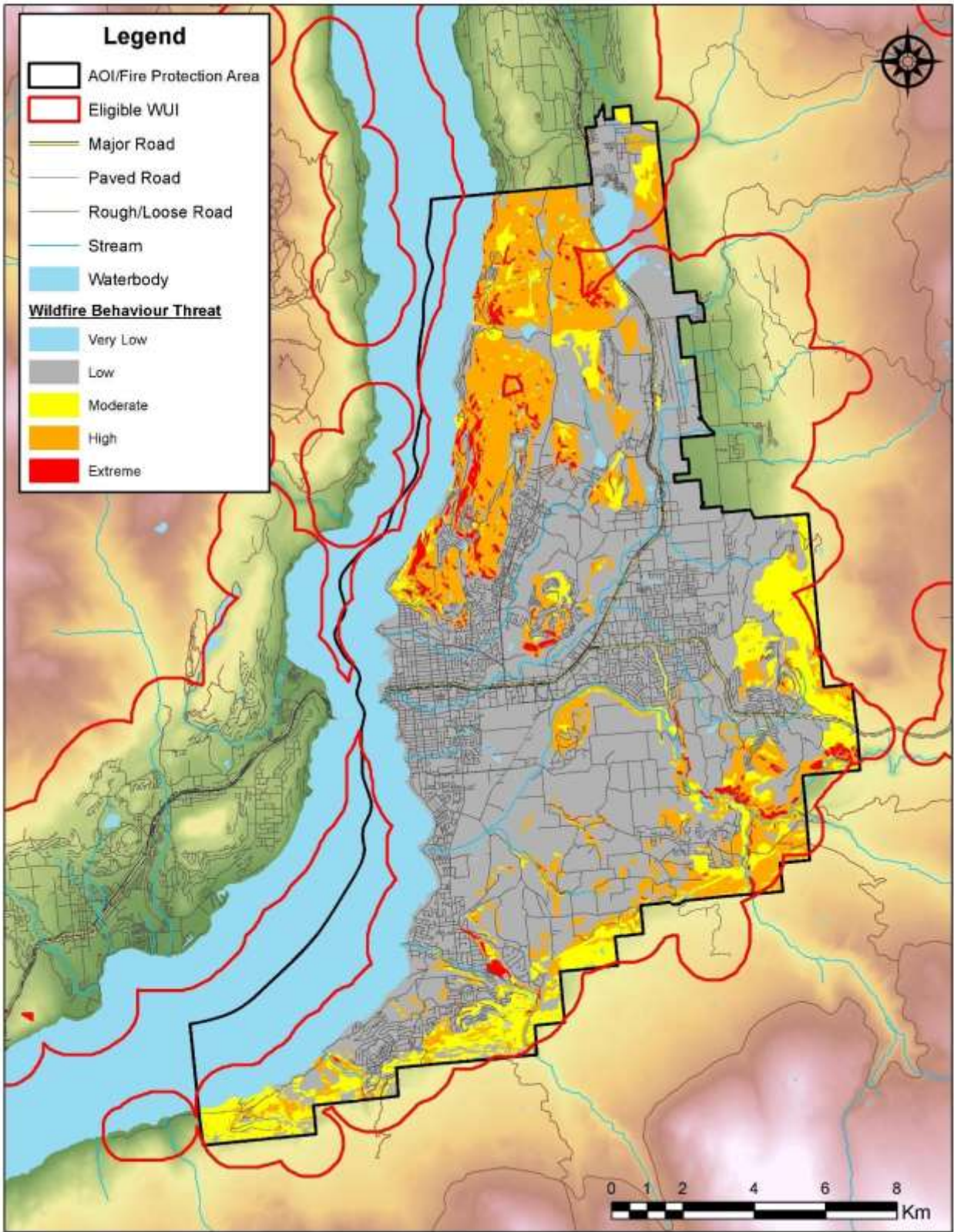
8. Local wildfire threat in Kelowna.
4.3.2 GRASS FIRE SIMULATIONS

Both the 2016 and 2011 CWPPs identified grass fuel types as a unique component of local wildfire threat within the municipality. Grass fuels are "flashy" – they dry quickly and can promote rapidly spreading fires that challenge suppression capacity. Grass fires have the potential to trigger much larger interface events as they can ignite structures, which are more likely to produce embers as they burn, and go on to ignite additional nearby structures.

One barrier to mitigating the hazard posed by grassy fuel types is quantifying the risk posed by them. Threat assessment tools currently offered to support funding requests for fuel management focus on forest fuel types and to date, there is no widely accepted analogous method for grasslands. As such, grass fire simulations were produced through Prometheus to identify probable areas of concern and support recommendations for grass fuel mitigation. These are detailed in Section 5.7.

Prometheus is a wildfire growth simulation model based on the Fire Weather Index (FWI) and Fire Behaviour Prediction (FBP) sub-systems of the Canadian Forest Fire Danger Rating System (CFFDRS). The model computes spatially explicit fire behaviour and spread outputs given fuel, topography and weather conditions.[14] Weather conditions for the wildfire simulations were based on average peak fire season (90th percentile) weather conditions, and the average mid-summer (July 15th - August 15th) wind direction. Simulations were run for three wind speed scenarios: a base model, representing an average of hourly mean wind speeds across the fire season (11 km /hour); a model for sustained high winds (30 km/ hour); and a model for gust speeds, based on average maximum wind values recorded across the fire season (50 km / hour).[15]

Maps 6-10 below show the simulated growth of a wildfire over 24 hours starting from each of five ignition points. Ignition points were selected where human activity, locations of values at risk, and extensive tracts of grassy fuels made potential wildfire events of higher concern.

Wildfire scenarios were generated for the area encompassing the municipal boundaries and a twokilometer buffer around it. For all the wildfire scenarios illustrated, *more area outside this two-kilometer buffer may burn in a 24-hour period.* As a result, some wildfire scenarios simulated with higher windspeeds appear to show a smaller area burned – however, this only reflects the area burned in 24hours within the two-kilometer buffer. Determining the full perimeter of the wildfire is outside the scope of this plan, which focuses on impacts to the City of Kelowna.

**These scenarios have not been verified by any experts at BC Wildfire Service.

[14] http://www.firegrowthmodel.ca/prometheus/overview_e.php

[15] *Kelowna Weather Stats.* https://kelowna.weatherstats.ca/charts/wind_speed-monthly.html

Map

24 Hour Fire Perimeter

11 km / hr windspeed

30 km / hr windspeed

50 km / hr windspeed

Legend

☐ AOI/Fire Protection Area	―― Rough/Loose Road
Eligible WUI	―― Paved Road
☆ Ignitions	―― Major Road
Fire Size by Hour	Wetland
0-4 hrs	―― Stream
4-8 hrs	Waterbody
8-12 hrs	
12-16 hours	
16-20 hours	
20-24 hrs	

0   0.75 1.5   3
Km
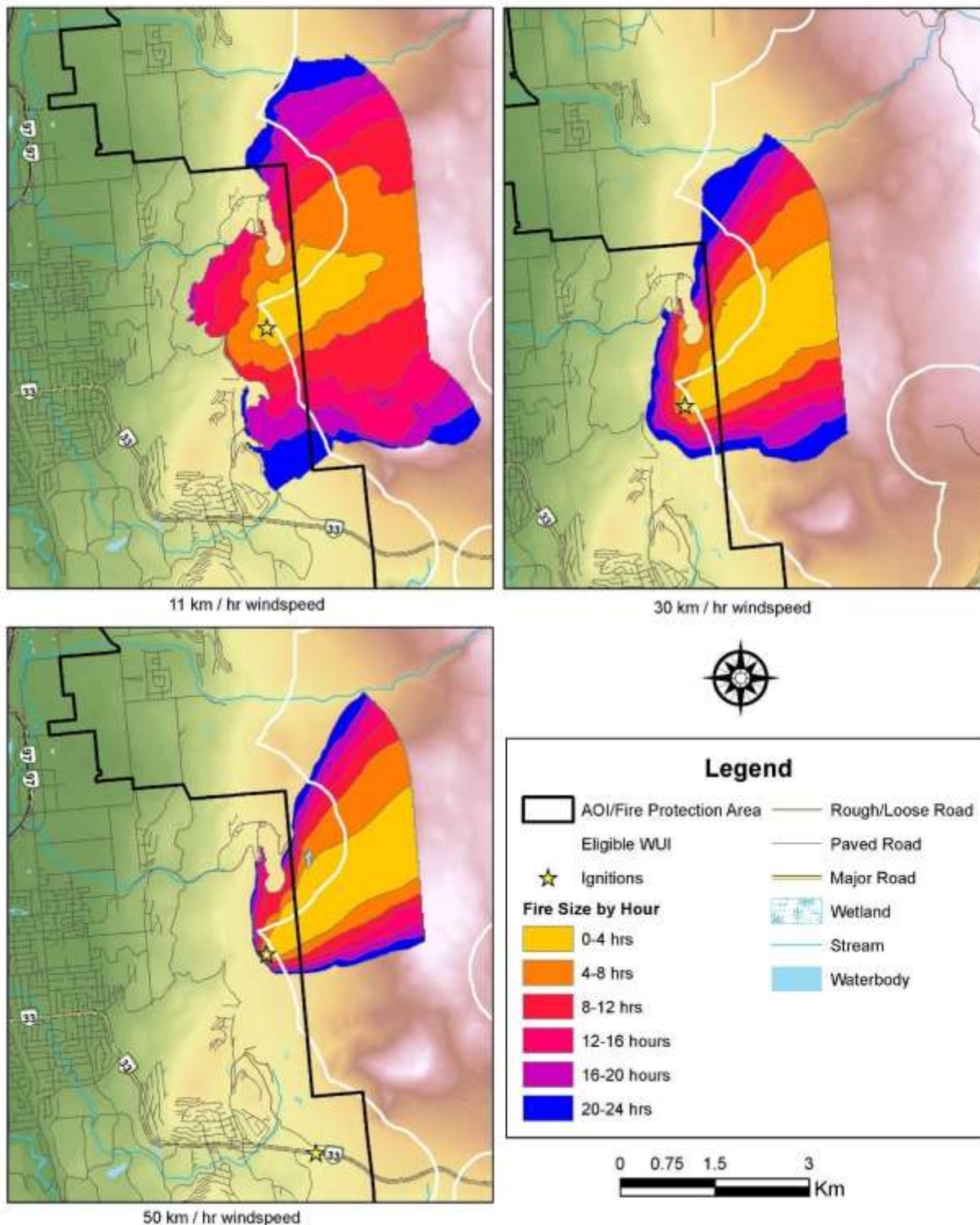
Map 9. Simulated 24-hour fire perimeter for an ignition occurring south of Tower Ranch in Kelowna.

24 Hour Fire Perimeter

11 km / hr windspeed

30 km / hr windspeed

50 km / hr windspeed

Legend

AOI/Fire Protection Area — Rough/Loose Road

Eligible WUI — Paved Road

☆ Ignitions — Major Road

Fire Size by Hour — Wetland
- 0-4 hrs — Stream
- 4-8 hrs — Waterbody
- 8-12 hrs
- 12-16 hours
- 16-20 hours
- 20-24 hrs

0   0.75   1.5   3 Km
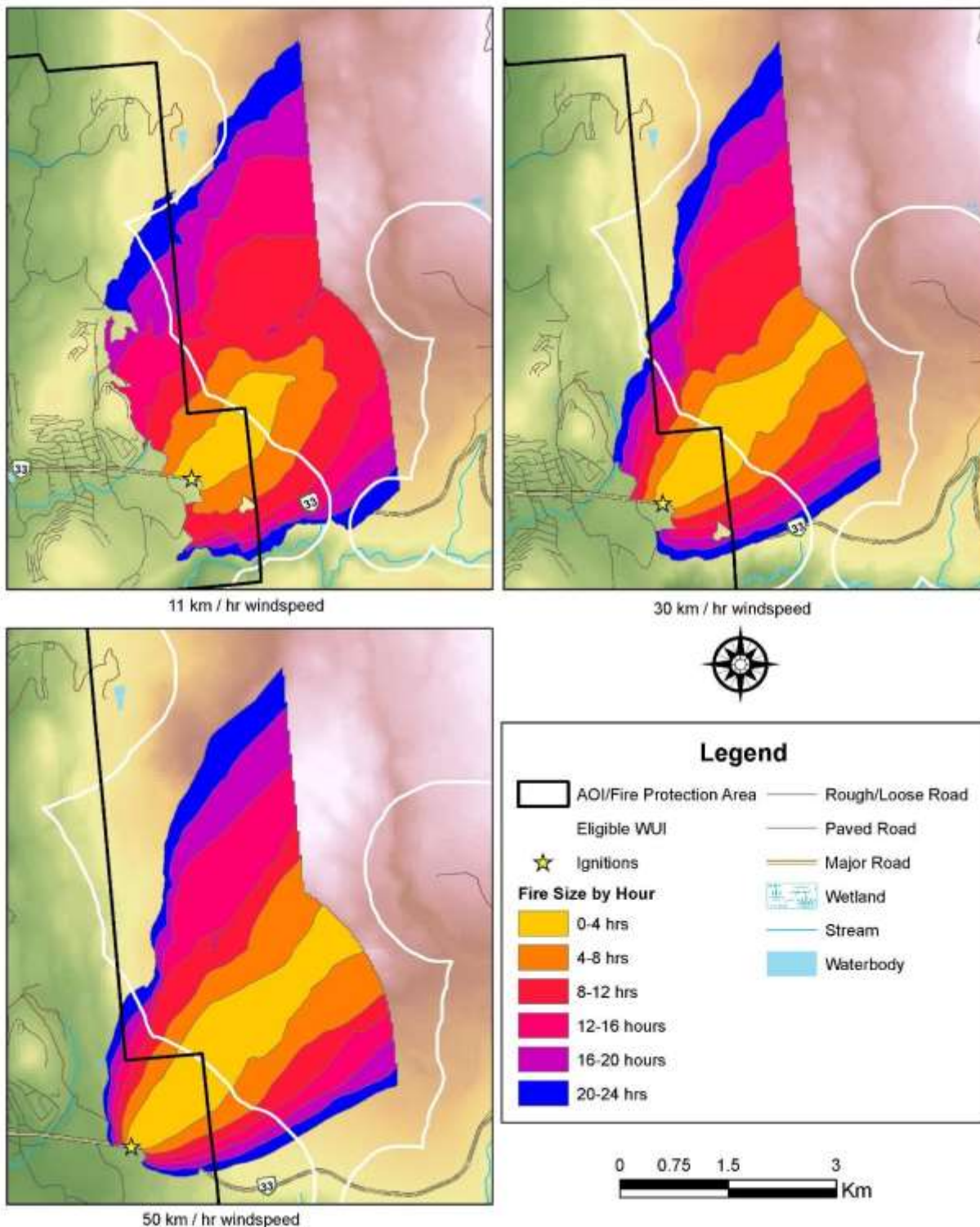
Map 10. Simulated 24-hour fire perimeter for an ignition occurring east of Black Mountain in Kelowna.

24 Hour Fire Perimeter

11 km / hr windspeed

30 km / hr windspeed

50 km / hr windspeed

Legend

AOI/Fire Protection Area	Rough/Loose Road
Eligible WUI	Paved Road
☆ Ignitions	Major Road
Fire Size by Hour	Wetland
0-4 hrs	Stream
4-8 hrs	Waterbody
8-12 hrs	
12-16 hours	
16-20 hours	
20-24 hrs	

0   0.35   0.7   1.4
Km

63
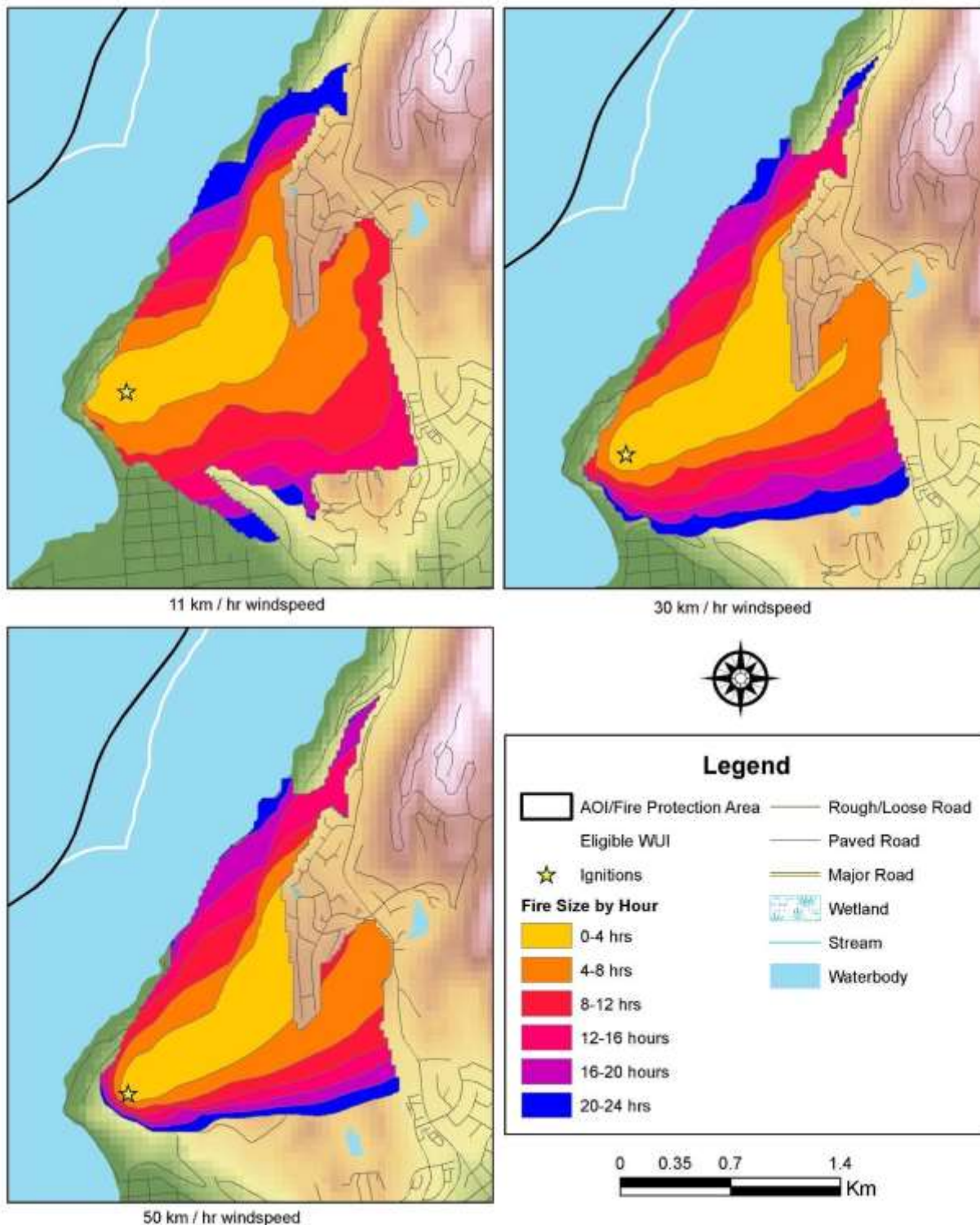
Map 11. Simulated 24-hour fire perimeter for an ignition occurring south in Knox Mountain Park in Kelowna.

24 Hour Fire Perimeter
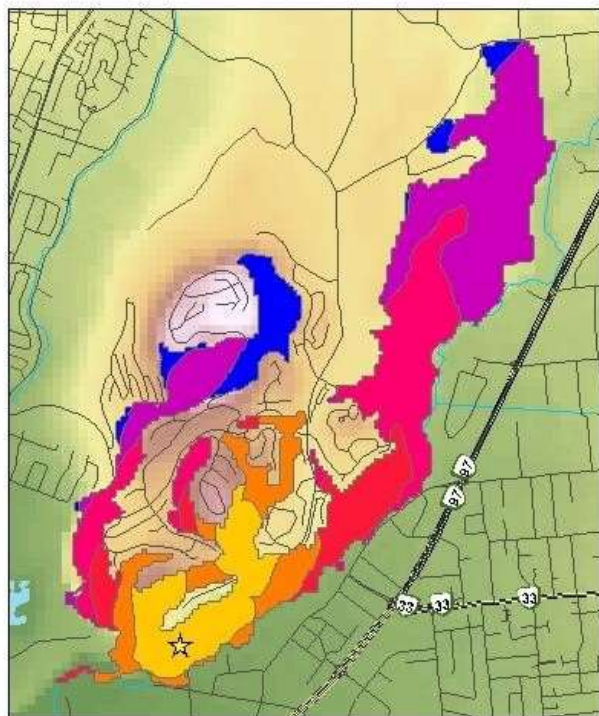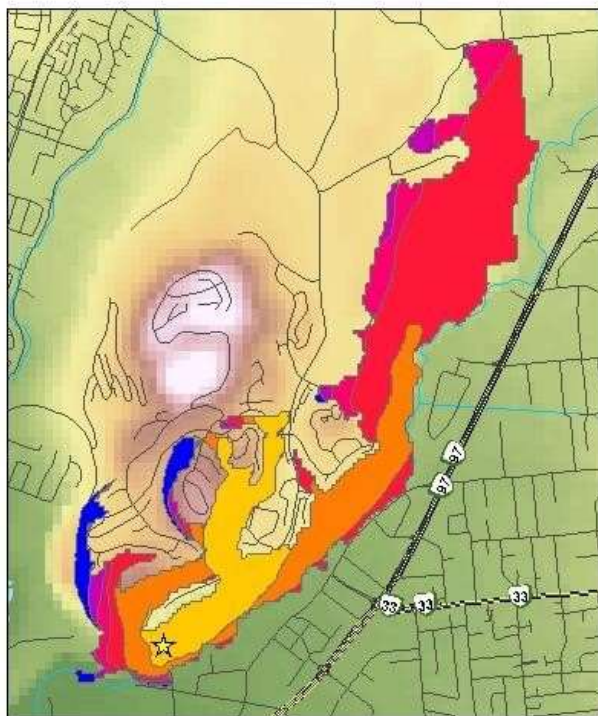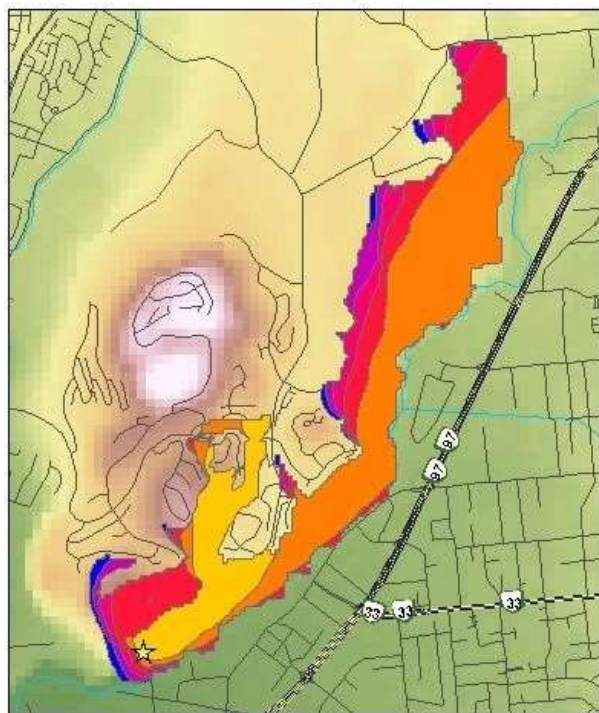
11 km / hr windspeed

30 km / hr windspeed

50 km / hr windspeed

Legend

AOI/Fire Protection Area
Ignitions
Rough/Loose Road
Paved Road
Major Road
Wetland
Stream
Waterbody

Fire Size by Hour
0-4 hrs
4-8 hrs
8-12 hrs
12-16 hours
16-20 hours
20-24 hrs

0   0.4   0.8   1.6
Km

Map 12. Simulated 24-hour fire perimeter for an ignition occurring on the south side of Dilworth in Kelowna.

24 Hour Fire Perimeter

11 km / hr windspeed

30 km / hr windspeed

50 km / hr windspeed

Legend

☐ AOI/Fire Protection Area	—— Rough/Loose Road
Eligible WUI	—— Paved Road
☆ Ignitions	—— Major Road
Fire Size by Hour	Wetland
0-4 hrs	—— Stream
4-8 hrs	Waterbody
8-12 hrs	
12-16 hours	
16-20 hours	
20-24 hrs	

0   1.75   3.5   7   Km
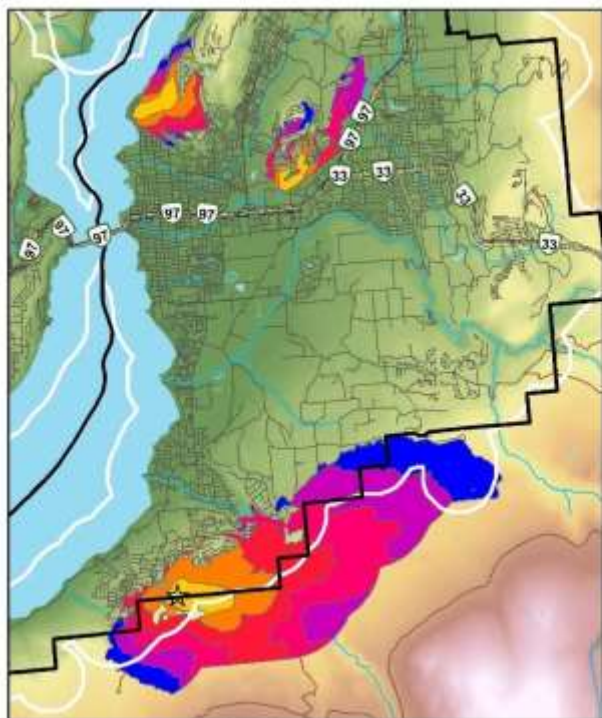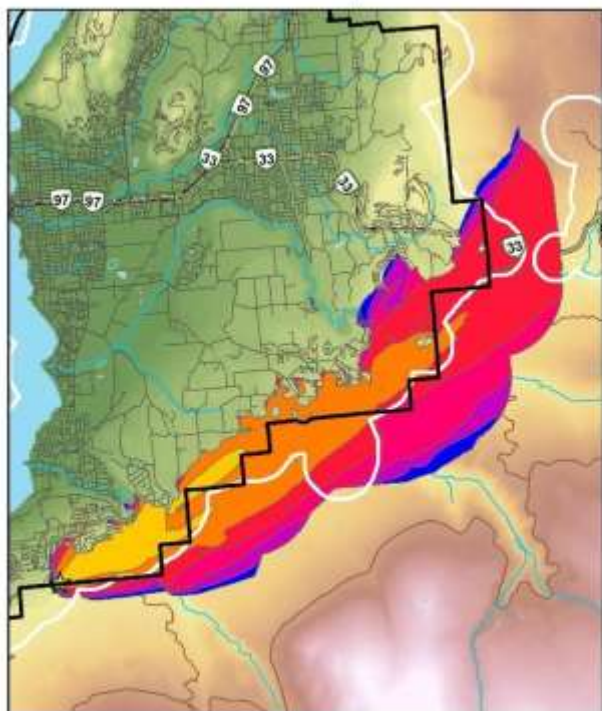
Map 13. Simulated 24-hour fire perimeter for an ignition occurring near Lebanon Creek in Kelowna.

4.4 HAZARD, RISK AND VULNERABILITY ASSESSMENT

The Hazard, Risk and Vulnerability Analysis (HRVA) that local governments undertake as part of the legislative requirements for development of a local Emergency Management Plan provides additional information about critical infrastructure important to the community.[16]

The purpose of a HRVA is to help a community make risk-based choices to address vulnerabilities, mitigate hazards, and prepare for responding to and recovering from hazard events. The HRVA process assesses sources of potential harm, their likelihood of occurring, the severity of their possible impacts, and who or what is particularly exposed or vulnerable to these impacts.[17] One way to ensure the HRVA is based on a current understanding of wildfire threat in Kelowna, is updating it concurrently with a CWRP Update – either this document or a future iteration.

SECTION 5: FIRESMART PRINCIPLES

FireSmart® is the nationally accepted set of principles, practices, and programs for reducing losses from wildfire and is founded in standards published by the National Fire Protection Association.[18] FireSmart concepts, including recommended FireSmart guidelines,[19] have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000.

FireSmart includes seven disciplines, which provide a sound framework for reducing wildfire risk to communities:
- Education
- Legislation and Planning
- Development Considerations
- Interagency Cooperation
- Cross-Training
- Emergency Planning
- Vegetation Management

16 More information on the instruction guide can be found here: https://www2.gov.bc.ca/gov/content/safety/emergencypreparedness-response-recovery/local-emergency-programs/critical-infrastructure-assessment.

17 Government of BC. 2020. *HRVA Example Report.* https://www2.gov.bc.ca/assets/gov/public-safety-and-emergencyservices/emergency-preparedness-response-recovery/local-government/hrva/hrva_forms-step_8-anytown_bcsample_hrva_report.pdf.

18 FireSmart   is the registered trademark held by the Partners in Protection Association.

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

The overarching goal of FireSmart is to encourage communities and citizens to adopt practices that help mitigate risk and impact of wildfire to assets on public and private property.

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

Priority Neighborhoods for FireSmart Initiatives

Variation of neighborhood characteristics (including age, topography, adjacency to vegetation, and others) in Kelowna translates to variation of both requirement for FireSmart and uptake of FireSmart principles.

The 2016 CWPP noted that overall, newer neighborhoods are more likely to be FireSmart in comparison with older ones, an observation that remains current. Newer neighborhoods have fewer occurrences of homes with wood roofing material, and a higher proportion of homes with fire-resistant exterior siding. Newer buildings are less likely to see the gaps in doorways, soffits, and under-eaves that may appear in older buildings. Throughout both new and old neighborhoods, non-FireSmart landscaping was a leading contributor to high levels of wildfire hazard to homes. Flammable conifer shrubs such as cedar and juniper were common. The placement of shrubs (close to windows, wooden fencing, below overhanging eaves) at many residences results in an extreme risk for home ignition should they ignite in a wildfire event. These hazards were identified in the 2011 CWPP, and also in a 2015 report from the Institute of Catastrophic Loss Reduction[7] which evaluated the FireSmart status of homes in the south and southeast outskirts of Kelowna. While the landscaping characteristics of many neighborhoods has significantly increased wildfire risk for residents, it is notable that this is a more approachable FireSmart principle for many homeowners to adopt than, for example, a more costly building renovation. There is an

7 Westhaver, A. (2015) *Risk reduction status of homes reconstructed following wildfire disasters in Canada.* Institute of Catastrophic Loss Reduction.

opportunity for homeowners to substantially reduce wildfire risk in their neighborhoods through landscaping work such as replacing shrubs, pruning up trees, raking needles and mowing grasses annually, and swapping bark mulch for gravel in rockeries.

For various reasons (funding amounts, available effort, etc.) FireSmart activities may not be able to address all neighborhoods, or all at one time. Based on general field observations (local wildfire threat assessment, current level of FireSmart, proximity to the WUI edge, restrictions to access/egress, adjacent fuel types and hazards, etc.), neighbourhoods within the WUI have been prioritized below, with those that would benefit the most from FireSmart planning and activities ranked first. As development in interface neighborhoods continue, and neighborhood characteristics change, prioritization may also

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change. It is recommended that this CWRP is scheduled for regular updates concurrent with development progress, to capture the shift in wildfire risk and hazard mitigation priorities.

Table 13 below reviews neighborhoods within Kelowna which should be prioritized for outreach and engagement, to increase residents' adoption of FireSmart principles. FireSmart 'attributes' are discussed in this table. In the context of this document, a FireSmart attribute refers to a single component or feature of the structure or the landscaping within 30 meters of it that increases resiliency to wildfire. For example, non-wood roofing materials, non-combustible siding, closed exterior stairs, non-combustible deck materials, deciduous vegetation in the yard, or vegetation removed in a meter radius around the home are examples of FireSmart attributes.

Table 13. Priority Neighbourhoods to improve FireSmart practices within the WUI

Priority	Location	Commentary
1	Barnaby Road	Older homes with generally few FireSmart attributes, and some homes with very hazardous landscaping features. Located mid and top of slope above Bellevue Creek and below Kuipers Mountain Park.
2	Clifton	Most homes likely not FireSmart; some older homes with very few FireSmart attributes and high vulnerability to ignition. Some homes with very hazardous landscaping features. Some larger rural lots with grass, shrub and tree cover - this intermixed vegetation increases wildfire risk for residents. Possible exposure to ember showers from wildfire events on the west side of Okanagan Lake.

3	McKinley Landing	Single access into neighborhood on narrow road with vegetation encroaching to the roadsides poses significant challenges for safe and rapid evacuation. Many homes likely not FireSmart; some older homes with very few FireSmart attributes and high vulnerability to ignition. Some homes with very hazardous landscaping features. Some larger rural lots with grass, shrub and tree cover - this intermixed vegetation increases wildfire risk for residents. At the southern end of this neighborhood new development is beginning. Possible exposure to ember showers from wildfire events on the west side of Okanagan Lake.
4	Finch Road	On the fringe of Kelowna Fire Protection Area, requiring extended travel time to access this neighborhood. Single road access. Some older homes with very few FireSmart attributes and high vulnerability to ignition, and some homes with very hazardous landscaping features. Some larger rural lots with grass, shrub and tree cover - this intermixed vegetation increases wildfire risk for residents. Possible exposure to ember showers from wildfire events on the west side of Okanagan Lake.
5	Dilworth	Winding, complex access. Homes are located at bottom-, mid- and top-ofslope locations, with the steep slopes between rows of homes covered with thick grass and tree cover. Most homes with very hazardous landscaping features.

Priority	Location	Commentary
6	Timberline Road	Single access into neighborhood on narrow road with vegetation encroaching to the roadsides. Neighborhood is comprised of large rural lots, backing onto Okanagan Mountain Park - the 2003 fire burned into this neighborhood. Grass and shrub cover is abundant throughout - this intermixed vegetation increases wildfire risk for residents.
7	Gallaghers Canyon	This neighborhood previously achieved FireSmart recognition, but it is not currently maintained. Access is one main throughfare with vegetation encroachment to the roadsides. Mixture of detached homes on conventional lot sizes and larger rural properties with continuous shrub, grass, and tree cover, as well as agricultural operations.
8	Lower Cedar Creek (Okaview, Quilchena streets)	Older homes with few FireSmart attributes and high vulnerability to ignition on average, and some homes with very hazardous landscaping features. Homes are located mid-slope, with the steep slopes between rows of homes covered with thick grass. Lebanon Creek Greenway creates a link of uninterrupted fuel loading between Okanagan Mountain Park and this neighborhood. Some homes are located at the top of Lebanon Creek ravine.

9	Kirschner / Black Mountain	Homes are located at bottom-, mid- and top-of-slope locations, with the steep slopes between rows of homes covered with thick grass cover. Older homes located at bottom of slope have few FireSmart attributes on average. Complex access into neighborhoods with winding roads that switchback up slopes. Golf course is located on the east side of Kirschner - irrigated lawns are a less hazardous fuel.
10	Kuipers	Homes are located at bottom-, mid- and top-of-slope locations, with the steep slopes between rows of homes covered with thick grass cover. Complex access into neighborhoods with winding roads that switchback up slopes. Critical infrastructure (Frost Reservoir) located in Kuipers Mountain Park at the top of slope. South end of neighborhood backs onto undeveloped private land then Okanagan Mountain Park. The 2003 fire burned into this neighborhood.
11	Tower Ranch	In initial stages of construction. Single access into neighborhood. Steep slopes between rows of homes covered with thick grass. Newer homes in this neighborhood have more FireSmart attributes on average.

5.1 EDUCATION

The City of Kelowna has undertaken several FireSmart education initiatives over recent years, including: establishment of a FireSmart-approved house on Knox Mountain, FireSmart information packages for distribution to citizens and developers seeking major retrofits or new single family builds (current wildfire DP requirements only extend to subdivision development, or multi-family, commercial, institutional and industrial development, but do not include single family homes), and a FireSmart demonstration garden (located at the intersection of Dilworth Drive & Summit Drive) showcasing alternatives to traditional flammable vegetation. Direct engagement with residents also occurs annually as Fire Department members (Fire Prevention Branch) attend neighborhood association meetings and make door-to-door visits as possible. Some Parks Services staff also have capacity to complete assessments and do so where needed.

Despite various initiatives, there are challenges in achieving a high level of public awareness and personal responsibility among citizens. A high seasonal resident population and significant tourist activity means there are many people entering Kelowna during the most critical months for wildfire risk. Tourists can be harder to reach with FireSmart education initiatives, especially if they primarily target homeowners, and temporary visitors or residents may have a less fulsome understanding of wildfire risk. Among full-time residents, awareness and engagement may be lacking due to entrenched attitudes that wildfire won't impact urban city neighborhoods, that so far change has not been required, and that relatively few people have been affected.

Accordingly, establishing a comprehensive FireSmart education program is a major theme of the

recommendations for this section. There is opportunity to facilitate these recommendations through the temporary or permanent hiring of a FireSmart Coordinator. Hiring a coordinator is a strategy becoming increasingly common for municipalities around BC who are looking to increase wildfire preparedness. A sample job summary and suggested skills and qualifications are included in Appendix C: Sample Job Profile - FireSmart Coordinator. Alternatively, the following recommendations could be achieved by staff members holding existing positions with the City should they have the capacity to take them on.

Figure 4. Home located in interface neighborhood in Kelowna with a FireSmart gravel strip at the property line

Table 14. Education recommendation and action items

Item #	Priority	Recommendation	Rationale	Lead Agency	Timeframe	Funding Source	Metric for Success
Objective: provide information to communities and citizens empowering them to adopt and conduct FireSmart practices to mitigate the negative impacts of wildfire to their homes/businesses, properties, and neighbourhoods.							
E1	High	**Create a FireSmart Coordinator position to oversee the delivery of a comprehensive FireSmart program.**	There is significant opportunity to expand education initiatives to improve resident awareness of wildfire risk. A barrier to expanding education initiatives thus far has been limited staffing resources. Accordingly, it is recommended that a new staff member be contracted to complete some of the recommended actions below. This position could fall under the Fire Prevention Branch of the KFD, or alternately fall under the Parks Services Department. Additional information (roles and requirements) for a FireSmart Coordinator position can be found in Appendix A: Sample Job Profile - FireSmart Coordinator.	City of Kelowna (Parks Services, and / or Kelowna Fire Department)	1 year	CRI funding	Position filled
E2	Moderate	**Promote FireSmart information and wildfire preparedness through social media.**	City social media streams occasionally make mention of wildfire hazard or FireSmart. FireSmart BC posts content frequently throughout the year - the City can simply re-post content that provides general information for residents about the FireSmart program. Posts could also focus on promoting before-andafter images of fuel treatment work as it is completed annually, or information on FireSmart education initiatives taking place, such as the planned community chipping program.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing	Local government funding	Posts per year increase; positive engagement with social media posts increases
E3	High	**Promote FireSmart information and wildfire preparedness through television or radio advertisements.**	Television or radio advertisements may reach a different audience not currently engaged with the municipality's social media channels. Consider engaging with the City of West Kelowna, who recently put out similar television advertisements, for suggestions in implementing this. A regional or partnered approach to obtaining funding and coordinating this effort may be appropriate for this recommendation, such as through the regional Emergency Management Organization. Also consider engaging with local radio stations to see if interviews could be scheduled during regular programming.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department), regional agency as necessary	Ongoing	CRI funding	Number of media installments made each year

Item #	Priority	Recommendation	Rationale	Lead Agency	Timeframe	Funding Source	Metric for Success
E4	Moderate	**Host FireSmart workshop(s) for residents.**	There is significant opportunity to increase the quantity of direct resident engagement to provide FireSmart education and resources. Consider hosting these periodically (e.g. every 2-3 years), with a goal of hosting at least two before the CWRP is updated, in a scheduled rotation with other education initiatives.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing (two workshops could be hosted in a 5-year timeline).	CRI funding	Workshops are hosted
E5	Moderate	**Give FireSmart presentations in local schools.**	FireSmart programming is infrequently presented in public schools. There is an opportunity to increase FireSmart and wildfire resiliency education across all demographics in the City, including youth. Education packages for different ages and presentation supplies are available through FireSmart BC.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department), School District 23	Ongoing	CRI funding	Presentations are held
E6	High	**Engage directly with residents in priority neighborhoods to offer Home Ignition Zone assessments and deliver wildfire preparedness information.**	See Section 5: FireSmart Principles for a list of priority neighborhoods. In addition, prioritize engaging with residents adjacent to areas where fuel treatments are being completed. Consider a joint application (which might allow for a larger grant funding total, or pooling of resources) for funding with syilx / Okanagan Nation to complete Home Ignition Zone assessments on structures within Duck Lake IR. When conducting Home Ignition Zone assessments, consider bringing video material to illustrate ember ignition and flammable vegetation hazards, as well as additional resources such as FireSmart Factsheets to provide more information about best choices for building material upgrades. Outreach staff should also promote the installation of gravel fuel breaks at slope tops on private property, as bylaws allow, as well as the purchase of rooftop sprinkler systems such as WASP sprinklers.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing	CRI funding	Number of residents engaged with

| E7 | High | As emergency evacuation plan(s) are completed, engage with residents to provide relevant emergency preparedness information. | This could involve publishing information on the City wildfire preparedness or FireSmart webpage, holding neighborhood workshops for residents, or developing and distributing evacuation guides to residents in vulnerable neighborhoods. | City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department) | 1-3 years (pending completion of evacuation planning) | CRI funding | Increased awareness of evacuation planning processes |
| E8 | Low | Engage with Kelowna Chamber of Commerce, Tourism Kelowna, and/or Destination BC to assess the potential feasibility of hosting a collaborative | Other public engagement efforts directed at homeowners, may not be effective in reaching seasonal tourist populations. | City of Kelowna (Potential FireSmart coordinator, Parks Services, and / or Kelowna Fire Department), | 1-3 years | CRI funding or local government funding | Increased awareness of wildfire ignition risks |

Item #	Priority	Recommendation	Rationale	Lead Agency	Timeframe	Funding Source	Metric for Success
		FireSmart campaign aimed at tourist audiences.		Destination BC, Tourism Kelowna			
E9	Moderate	Host FireSmart / wildfire preparedness booths at public events and/or festivals during the summer.	Promoting wildfire preparedness at these venues could help share information with a broader array of public demographics than targeted resident engagement. This can also serve to increase the general visibility and familiarity of the FireSmart brand and wildfire preparedness concepts.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing (suggest participation in 2-3 events per season)	CRI funding	Increased participation in number of events
E10	Moderate	Promote uptake into the FireSmart Neighbourhood Recognition Program.	Increasing uptake in the FireSmart Neighborhood Recognition program can help facilitate the reduction of hazardous fuels accumulations on private property. Several neighbourhoods in Kelowna have achieved FireSmart Neighbourhood Recognition in previous years, but the FireSmart website suggests this is no longer maintained. Neighborhood leaders should be engaged to maintain the previously achieved Neighborhood Recognition status. Existing resident associations could be engaged to identify potential leaders in other areas.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	3-5 years	CRI funding	Increased number of certifications in the FireSmart Neighbourhood Recognition Program

| E11 | Moderate | Install signage at locations of recent fuel treatments | The purpose of signage should be to draw attention to work being undertaken by the City to increase community wildfire resiliency, through before-and-after photos, and notes about the date and method of treatment. | City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department) | Ongoing | CRI funding or local government funding | Signs installed |

5.2 LEGISLATION AND PLANNING

A review of relevant policy documents was undertaken to identify where existing bylaws, policies, guidelines, and standards of practice had potential influence on wildfire risk, planning, and management. Where current legislation is in direct or indirect conflict with proactive wildfire planning recommendations have been made to better align with community safety, particularly in the area of current and future subdivision development. A review of updates to Kelowna's bylaws, policies, and plans relevant to wildfire risk and emergency planning was provided earlier in Section 2: Relationship to Other Plans and Legislation.

The 2011 and 2016 CWPPs recommended the review and update of the City's Wildfire Development Permit (DP) policy. In 2020, a Wildfire Policy & Development Planning review was completed, with updates approved by select departments within the City of Kelowna. Policy changes generated from the Wildfire Policy & Development Planning review were incorporated into the 2040 OCP, which was endorsed by Council in January 2022. Updates were focused on Chapter 15: Natural Hazard Areas and Chapter 20: Hazardous Conditions – Wildfire Development Permits.

Where applied, the revised Wildfire DP guidelines comply with best practices to mitigate fire risk in the following aspects of home and neighborhood development:
- Building materials standards,
- Landscaping standards,
- Building setbacks, road width and access routes, and hydrant locations; and
- Mitigation of wildfire hazards on future park lands prior to turnover to Kelowna.

A key vulnerability of the 2040 Wildfire DP guidelines is the exemption for construction of a single-family dwelling on an existing lot. This exemption was also present in the 2030 OCP. The 2016 CWPP recommended that wildfire development permits be triggered for new builds and major retrofits or renovations (i.e., a complete re-build on a previously existing foundation) as well as for land subdivisions. Through consultation with the planning department, the 2016 CWPP identified that expanding the scope of the Wildfire DP guidelines, to include single-family dwellings on existing lots, would require additional resources from the City of Kelowna in order to process the permits. It was estimated that an additional 2 full-time equivalent staff to process the files would be needed. This capacity assessment remains current. Expansion of the Wildfire DP guidelines to include single-family dwellings on existing lots is recommended again in this CWRP as it would align the Wildfire DP requirements with the requirements of the other Hazardous Condition DPs, which include single-family dwellings on existing lots, Expansion of the Wildfire DP guidelines would also accelerate the rate at which housing stock within Kelowna adopts FireSmart principles, increasing the efficiency and completeness of the policy overall.

Another opportunity for strengthening policy and planning includes the development of the city wide Sustainable Urban Forest Strategy. There is a significant opportunity in the development of this Strategy

to implement policies that will manage municipal green space at a landscape level. Managing forest ecosystems in Kelowna to support their continued health and resilience will support wildfire risk reduction goals.

Table 15. Legislation and planning recommendation and action items

Item #	Priority	Recommendation	Rationale	Lead Agency	Timeframe	Funding Source	Metric for Success
Objective: Provide the means for Kelowna to implement wildfire risk reduction actions through bylaws and legislation by outlining local government responsibilities regarding wildfire						
L1	High	**Update the Urban Forest Management Strategy.**	The Sustainable Urban Forest Strategy includes goals and objectives to achieve an ecosystem-based management vision of the urban forest landscape in Kelowna. Because the scope of planning for this strategy is at the landscape level, it is appropriate to include interface wildfire considerations within it. Additionally, the planning timeframe for the current Sustainable Urban Forest Strategy is 2011-2021, so it is appropriate to schedule the completion of an updated document. When the Sustainable Urban Forest Strategy is updated, the proposed goals and objectives should consider the wildfire risks and hazards identified and align with the recommendations made in this plan.	City of Kelowna (Parks Services), consultant support	0-1 years	Grant (e.g. 2BT) and/or Local government funding	Plan completed and adopted
L2	Moderate	**Adopt a standard for fuel management in parks and green spaces.**	A similar recommendation (#29) was made in the 2016 CWPP. Implementation of this recommendation was begun during the 2020 Wildfire DP and policy review process, but not completed. Review options for adopting a standard for fuel management outside of a Wildfire DP update process.	City of Kelowna (Parks Services), consultant support	1-3 years	CRI funding	Standard adopted.
L3	High	**In 2026, initiate an update of this CWRP.**	A current (i.e., no more than 5 years old) CWRP is a requirement for further funding under the CRI program.	City of Kelowna (Parks Services), consultant support	5 years	CRI funding	CWRP update initiated.
L4	High	**Adopt the Wildfire DP Terms of Reference.**	The Terms of Reference was developed during the 2020 Wildfire Policy & Development Planning review, and states criteria by which Wildfire Hazard Reports must be prepared. The preparation of Wildfire Hazard Reports is a condition that must be met prior to development permit application approval. This recommendation builds on a similar one made in the 2016 CWPP (#20)	City of Kelowna (Planning & Development)	0-1 years	CRI funding	Terms of Reference adopted.

| L5 | High | **The Wildfire DP should Include/incorporate the construction and major renovation of new single-family** | The Wildfire DP should be triggered for this type of development and construction as part of the building permit. This recommendation was made in the 2016 CWPP (#17) and the rationale remains current: expanding the Wildfire DP to include construction and major renovation of single-family homes on existing lots will align the | City of Kelowna (Planning & Development) | 3 years | CRI funding | Wildfire DP amended. |

Item #	Priority	Recommendation	Rationale	Lead Agency	Timeframe	Funding Source	Metric for Success
		homes on existing lots into the Wildfire DP process'.	Wildfire DP with other hazardous conditions development permit and expand the number of FireSmart compliant homes gradually. It will ensure the completeness, efficiency, and efficacy of this policy.				
L6	Low	**Implement the recommendations of the NonStructural Flood Mitigation Resource Guide.**	The Non-Structural Flood Mitigation Resource Guide[8] identifies wildfire as a cumulative pressure with the potential to worsen the effects of flooding in the Central Okanagan.	City of Kelowna	Ongoing	Local government funding	Recommendations implemented.
L7	Low	**Amend the Subdivision, Development & Servicing Bylaw (Bylaw #7900) to include a requirement for the installation of fire hydrants outside linear parks and natural area parks.**	The 2016 CWPP recommended that the proximity of hydrant locations to access points for forested parks should be a consideration during the design process for new subdivisions (Recommendation #27). A guideline related to this topic was reviewed but not included during the 2020 Wildfire Policy & Development Planning process. Alternately, include this requirement within the Wildfire DP Terms of Reference.	City of Kelowna (Planning & Development)	3 years	CRI funding	Bylaw amended.

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[8] Regional District of Central Okanagan. (2021). *Non-Structural Flood Mitigation Resource Guide.* https://www.rdco.com/RDCO-Flood-Resource-Guide_20211216.pdf

5.3 DEVELOPMENT CONSIDERATIONS

Important factors that can be planned for (and regulated through the land use planning and development process) which affect public safety during a wildfire include:[1]

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

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

An additional important development consideration includes access to natural and

Figure 5. Example of a perimeter trail - houses located upslope, left side of photo. wildland areas adjacent to homes.

Recommendations have been made regarding the installation of *perimeter trails* – paths which run along the boundary of private property where it interfaces with wildland areas – to reduce fuel loading adjacent to the boundaries of residences, and to increase safe access for first responders. In some areas these are already installed or have been incorporated into neighborhood design at the discretion of the Parks Services department. However, a more formalized process should be considered. And, in key locations where no perimeters or ring roads have been created, the City should consider purchasing easements to install these.

The location and condition of lands turned over to Kelowna during development has been identified as a challenge to overall wildfire resiliency in neighborhoods. As the 2016 CWPP noted, park lands have often

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encompassed the steepest slopes in the development area, and are often in close proximity to, or are intermixed with, new neighborhoods. It is recommended that a process be developed that would allow for early review of prospective parks locations by Kelowna city staff, in order to reduce the likelihood that park design and location increases wildfire hazard to the closest homes. The 2016 CWPP also recommended such a review process, and identified wildfire threat, location of the park relative to slope and values at risk, access and associated liability to the City as key factors that the review process should analyze. These considerations remain relevant and important.

Table 16. Development considerations recommendation and action items

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: To embed FireSmart practices and considerations into all development within Kelowna.							
D1	High	**Engage a qualified professional (such as a Local FireSmart Representative) to update or complete formal FireSmart assessments of critical infrastructure within the Wildfire DP area.**	Assessments should be planned and implemented in order of critical infrastructure importance.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	3-5 years	Critical infrastructure assessments completed	CRI grant
D2	Moderate	**Use fire-resistant construction materials, building design and landscaping for all critical infrastructure when completing upgrades or establishing new structures**	The City of Kelowna should work towards increasing the resilience of critical infrastructure to wildfire.	City of Kelowna (Engineering, Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing	Infrastructure upgrades adopt FireSmart principles	Local government funding
D3	Moderate	**Develop a standard for early review of prospective parks locations at the neighborhood planning stage, by Kelowna Parks Services staff.**	Early review of prospective parks locations will decrease the chance of park design increasing wildfire hazard for neighboring residences. The 2016 CWPP included a similar recommendation (#32), and proposed that review by the Parks department be accomplished by a 'preliminary' development permit report, with proposed park lands submitted early in the process. Consider developing this review process alongside the upcoming Parks Master Plan.	City of Kelowna (Potential FireSmart Coordinator, Planning & Development, Parks Services, and / or Kelowna Fire Department)	1-3 years	Standard adopted	Local government funding

| D4 | Moderate | **Assess the feasibility of purchasing easements around subdivision boundaries in order to install perimeter trails.** | Numerous subdivisions have been constructed in interface neighborhoods with no formalized access to the natural areas which they abut. Installing perimeter trails to appropriate specifications can reduce fuel loading adjacent to homes (within Priority Zones 2 and 3) and allow first responders to access natural areas more quickly and safely in the event of an interface fire. | City of Kelowna (Potential FireSmart Coordinator, Planning & Development, Parks Services, and / or Kelowna Fire Department) | 3-5 years | Evaluation completed | Local government funding |

5.4 INTERAGENCY COOPERATION

Identifying and linking staff members from different municipal government departments, local Indigenous communities, and stakeholders such as emergency service providers from other government agencies, private critical infrastructure operators, and parks managers (both from the City of Kelowna and elsewhere) is critical in ensuring a coordinated effort in reducing wildfire risk, as well as increasing opportunity for accessing various funding opportunities, sharing knowledge and data, and strengthening response efforts in the event of a wildfire.

Community FireSmart Resiliency Committee (CFRC)

Agency	Title	Role in CWRP Development	Future Opportunities
City of Kelowna Parks Services	Urban Forestry Supervisor Urban Forester	Provided data, information, and other relevant plan content, including local level fire response knowledge and wildfire risk reduction initiatives; coordination of CFRC activities; provided review and input.	Coordinate with other municipal departments to achieve the implementation of CWRP recommendations. Coordinate with Corporate Communications to provide outreach to applicable stakeholders and audiences.
City of Kelowna Fire Department	Fire Chief Deputy Fire Chief Fire & Life Safety Educator	Provided data, information, and other relevant plan content; provided advisory support to determine CWRP actions; provided review and input.	Support implementation of CWRP recommendations as applicable to department role by providing technical expertise, background knowledge and information.
City of Kelowna Planning & Development	Community Planning & Development Manager		
City of Kelowna Policy & Planning	Policy & Planning Department Manager		
City of Kelowna Communications	Community Communications Manager		
City of Kelowna Infrastructure Operations	Infrastructure Operations Manager		

Kelowna's Community FireSmart Resiliency Committee (CFRC) is comprised of local government members. In addition to this formalized CFRC, information sharing and consultation occurred with other First Nations and third-party agencies. Key contributions came from Okanagan Indian Band, BC Parks, and the Regional District of Central Okanagan (Parks Department).

Other cooperative initiatives currently underway include the formation of an evacuation planning roundtable, spearheaded by the RDCO. The RDCO was granted funds in 2021 through UBCM to support evacuation planning for residents. Funds will be allocated to a planning process, involving member municipalities of the RDCO, that will result in an evacuation planning template for communities to apply at a smaller scale.

In the review and information gathering process for this plan, it was found that good working relationships exist between many individual local government agencies, but a formalized strategy for intentional, regular information sharing is lacking. This is contributing to knowledge gaps amongst different departments and organizations.

Engagement and cooperation with different agencies can support wildfire risk mitigation efforts throughout the municipality, including on these areas of land that are either privately owned, or not managed by the municipality. Recommendation and action items below identify opportunities for the City of Kelowna to continue growing interagency relationships and increase interagency cooperation.

Table 17. Interagency cooperation recommendation and action items

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: To broaden from a department or agency single jurisdiction-based approach to a risk driven, multi-agency and multi-scalable approach.							
I1	Moderate	**Collaborate with the MoF, BC Parks and BCWS to promote knowledge sharing about completed and ongoing wildfire risk reduction projects near Kelowna, and to strategize mid- to long-range planning for future adjacent treatment areas.**	As a result of a re-organization of funding allocations for fuel treatment work, MoF has taken on responsibility for much of the fuel treatment work that occurs on Crown Provincial land, while municipalities are able to complete fuel treatment work on municipally-held land. The City should share information about fuel treatments completed outside municipal boundaries on Provincial Crown land with MoF, as well as with BC Parks and BCWS in order to support the prioritization of surrounding areas for maintenance and re-treatment. Consider sharing information such as the spatial location, year of treatment, method of treatment, and estimated time for re-assessment and maintenance work.	City of Kelowna (Parks Services), MoF, BC Parks, BCWS	1 year	Information shared	Local government funding
I2	Moderate	**Schedule regular meetings of members of the CFRC (6 months to 1 year).**	Increasing the frequency of communication between different municipal departments responsible for wildfire risk reduction work is important to increase cooperation and efficiency in achieving community wildfire resiliency objectives.	City of Kelowna (all parties involved in CFRC)	Ongoing (at least one meeting annually)	Meetings held	Local government funding
I3	Moderate	**Through the CFRC meetings or another planning table, initiate and maintain regular information sharing meetings with RDCO staff, and other municipalities in the Central Okanagan.**	The evacuation planning working group scheduled for winter of 2021 is an example of an alternate planning table which could be leveraged to initiate this schedule of information sharing. Topics around which regular communication should take place include: FireSmart initiatives, fuel treatment work, community wildfire resiliency initiatives, and emergency planning work being conducted by different agencies, as well as concerns, priorities, and lessons learned from recent fire events.	City of Kelowna, RDCO or other municipality staff as applicable	Ongoing (at least one meeting annually)	Meetings held	CRI funding or local government funding

| I4 | Moderate | **Engage with operators (e.g., BC Hydro, Fortis BC, Kelowna Airport Authority) to encourage completion of FireSmart assessments for privately owned critical or hazardous infrastructure.** | Not all critical infrastructure is operated by the municipality, so wildfire resiliency issues must be addressed cooperatively. | City of Kelowna, private operators | 3 years | Critical infrastructure assessments completed | CRI funding or local government funding |

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
I5	Moderate	**Engage with Indigenous communities to identify opportunities for collaboration related to community wildfire resilience initiatives.**	Engagement with Indigenous communities related to community wildfire resilience initiatives aligns with direction from the 2040 OCP to strengthen the relationship with the syilx / Okanagan people through initiatives and processes to support reconciliation in Kelowna (Objective 9.2). Consider the following actions to strengthen engagement: • Meet with appropriate representative from syilx/Okanagan Nation or other Indigenous communities prior to application for CRI grant funding, or otherwise share information at this time about FireSmart and wildfire resiliency initiatives Kelowna is planning to pursue, to identify possible opportunities for collaboration. • Before the fire season each year, ensure emergency contact information is up-to-date, and share information regarding emergency management planning concerns and priorities, as appropriate. • Share updates regarding plans to complete grass management treatments per the recommendations of this CWRP, especially any plans to pursue prescribed burning, to identify possible opportunities for collaboration. • Share information regarding the availability of grant funding to support syilx/Okanagan Nation or other Indigenous communities' participation.	City of Kelowna (Potential FireSmart Coordinator, Parks Services, and / or Kelowna Fire Department)	Ongoing (at least one meeting annually)	Number of meetings or information sharing exchanges	CRI funding or local government funding

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5.5 CROSS-TRAINING

The Kelowna Fire Department provides training to its members for interface specific wildfire events and to gain experience in interface wildfire incidents. As reported in the 2016 CWPP, the KFD focuses training on structural firefighting but also includes annual wildland interface training in the spring. It is recommended this program be maintained or expanded.

The 2016 CWPP also identified a lack of cross-training with BCWS, which currently remains the case. Although both the KFD and BCWS identified a positive working relationship with each other, there are benefits to be gained from scheduling regular training sessions. Training sessions for crews can focus on re-introducing suppression equipment for each agency, and identifying and sourcing solutions where incompatibilities may exist. Hosting training exercises do not imply taking on responsibilities outside of roles for each agency. Rather, the focus of these training exercises should be to enhance understanding of the capacity and capabilities of agencies with which KFD might cooperate with in the event of an interface wildfire event. This will allow KFD to focus their training and professional development within the role of their agency.

Similarly, few formal training events have been held between Kelowna and other municipalities, although positive rapport between local government agencies is reported. Consistent, scheduled, and purposeful engagement is a benefit for engagement across municipal fire departments for similar reasons.

Table 18. Cross-training recommendation and action items.

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: To support the development of comprehensive and effective wildfire risk reduction planning and activities, as well as a safe and effective response.							
C1	High	**Hold periodic multi-agency training exercises focused on interface wildfire incident response with BCWS and / or other mutual aid partners.**	Training exercises are currently not held between the Kelowna Fire Department and BCWS or other municipalities in the Central Okanagan. While working on wildfire incidents has helped foster a positive working relationship between the Kelowna Fire Department and BCWS, there are additional benefits to be gained from regularly hosting training exercises. A rotating schedule of in-person and table-top training exercises should be established between the Kelowna Fire Department and BCWS as well as other municipalities with which the City holds mutual aid agreements. For example, in-person exercises could be held every 2-4 years and tabletop exercises more frequently (e.g., annually).	Kelowna Fire Department	Ongoing (two inperson exercises could be held in a five-year timeframe)	In-person and / or tabletop exercises held	CRI funding
C2	Moderate	**The Kelowna Fire Department should maintain or expand the interface wildfire training programs offered to its members.**	WFF-1 and S-231 (Engine Boss) is required for BCWS deployment; continued deployment with BCWS contributes valuable experience to the department about response to interface wildfire incidents. Consider training a percentage of members in these courses. Attending the yearly Wildfire Training Symposium in Penticton could be a component of interface wildfire training and education.	Kelowna Fire Department	3-5 years	Percentage of members certified in WFF-1 maintained; additional course or interface wildfire training options offered	CRI funding
C3	Low	**Attend the annual FireSmart conference.**	The annual FireSmart conference is an avenue to increase exposure to new FireSmart education tools, and community wildfire resiliency initiatives being undertaken around the Province.	Kelowna Fire Department, Parks Services	Ongoing	Conference attended by Kelowna Fire Department and/ or Parks Services staff members	Local government funding

5.6 EMERGENCY PLANNING

As evidenced in recent years, when multiple wildfire emergencies are taking place throughout the province, BCWS resource availability may become scarce. Deployment of provincial resources occurs based on the Provincial Coordination Plan for Wildland Urban Interface Fires.[22] Therefore, government wildfire preparedness and resource availability are critical components of community wildfire resilience – individuals and agencies need to be ready to act.

Pre-Incident & Evacuation Planning

Two complementary planning processes involving City of Kelowna staff are scheduled for the winter of 2022: wildfire pre-incident planning and preliminary evacuation planning. Wildfire pre-incident planning will be undertaken by the Kelowna Fire Department. Preliminary evacuation planning is an initiative of the Regional District of the Central Okanagan, that will involve participation from Kelowna city staff, including Parks Services staff.

The preliminary evacuation planning process will involve creating a "template" evacuation plan with funds obtained by the Regional District that communities can then refine and complete at a smaller scale, with site-specific details. Emergency access and evacuation planning is of particular importance in the event of a wildfire, and the completion of this preliminary planning process, and follow up afterwards to create community specific evacuation plan(s) is therefore a high priority recommendation.

An evacuation plan could:

- Map and identify safe zones, marshalling points and aerial evacuation locations
- Plan traffic control and accident management
- Identify volunteers that can assist during and/or after evacuation

Creating an effective evacuation plan with community specific strategies for emergency response includes the careful examination of unique community and neighborhood attributes:

- Demographics, geography, and available emergency response resources
- Access and egress routes and potential traffic flows and pinch points (one option to gather related information is through traffic flow modelling)
- Other local hazards and constraints that may pose unique challenges to evacuation

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

Table 19. Sample components of a wildfire pre-incident plan.

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

The development of a Total Access Plan is recommended, and it may be useful to complete this at the same time as the wildfire pre-incident plan. A Total Access Plan should include the following pieces of information, in written documentation and on maps and spatial layers:

- All maintained trails and roads within the municipality
- Type of access available for each access route (foot, ATV, etc.)

- Trails which are gated and / or have barriers
- Information for unlocking / removing barriers (e.g., key location or ownership)
- Natural areas where access is insufficient
- Sensitive environmental areas where the lowest-impact access options should be prioritized

As part of pre-incident planning, the City may consider developing local daily action guidelines based on expected wildfire conditions. Table 20 below provides a template that can be tailored specifically to the City, outlining actions that staff, fire department members, and other emergency staff can take as fire danger levels change throughout the year.[9] Some of these actions are already undertaken annually, (e.g. during Extreme fire danger, EOC staffing availability information is updated, and natural area closures occur), while other actions have not yet been initiated. Year-round, fire danger signs posted throughout municipality should be updated to reflect the current fire danger.

Table 20. Example of a Wildfire Response Preparedness Condition Guide

FIRE DANGER LEVEL	ACTION GUIDELINES
LOW	- All Community staff on normal shifts.
MODERATE	- All Community staff on normal shifts - Information gathering and dissemination through Kelowna's CFRC
HIGH	- All Community staff on normal shifts. - Daily detection patrols by staff. - Regional fire situation evaluated. Daily fire behavior advisory issued. - Wildland fire-trained Community staff and EOC staff notified of Fire Danger Level. - Establish weekly communications with CFRC - Hourly rain profile for all weather stations after lightning storms.

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[9] CRI FCSF 2021 CWRP supplemental instruction guide

EXTREME	• • Rain profile (see III). • • Daily detection patrols by Staff. • Daily fire behavior advisory issued. • Regional fire situation evaluated. EOC staff considered for stand-by. Wildfire Incident Command Team members considered for stand-by/extended shifts. • Designated Community staff: water tender and heavy machinery operators, arborists may be considered for stand-by/extended shifts. • Consider initiating Natural Area closures to align with regional situation. • Provide regular updates to media Services members/Community staff on fire situation. • Update public website as new information changes.
FIRE(S) ONGOING	• • All conditions apply as for Level IV (regardless of actual fire danger rating). Provide regular updates to media/structural fire departments/staff on fire situation.

	• Mobilize EOC support if evacuation is possible, or fire event requires additional support. • Mobilize Wildfire Incident Command Team under the direction of the Fire Chief. • Implement Evacuation Alerts and Orders based on fire behavior prediction and under the direction of the Fire Chief.

Mutual Aid Partners

The 2016 CWPP identified that the Kelowna Fire Department has mutual aid agreements in place with other municipalities and RDCO Fire Departments in the central Okanagan that the Kelowna Fire Department may respond to areas outside the municipal boundary on both RDCO and Crown land to engage in wildfire suppression until BCWS arrives. There have been no changes to this arrangement since then.

Firefighting Resources

The 2016 CWPP identified the Kelowna Fire Department as a well-resourced highly organized department which is able to provide high quality emergency and public safety services to the City and surrounding area. No significant changes to this assessment have occurred since that time. Call-outs have not trended upwards significantly or disproportionately to population growth. The fire department has hired an additional 38 members, also in line with the growing size of the municipality.

The 2016-2030 Kelowna Fire Department Strategic Plan noted the possible need to plan to open an additional fire station in the municipality – this action item was completed with the opening of Station 5

in 2019. The Strategic Plan recommends potentially obtaining additional smaller apparatus with the opening of this station. Smaller bush trucks equipped with pump and water capabilities have been phased in as a response vehicle of choice to an interface wildfire event, and remain a priority for resource allocation.[10]

The 2016 CWPP did not identify any significant gaps in capacity with relation to equipment inventory. However, Kelowna currently does not keep a Structural Protection Unit. Historically, the fire department has relied on the ability to request these units from neighboring jurisdictions or from UBCM as necessary. However, the 2016 CWPP recommended that the City stays up to date on the location of, and request process for, an SPU in neighboring jurisdictions; that the KFD consider an SPU training session to gain experience with the SPUs available; and that the City assess whether a SPU may be a good investment.

These recommendations have been renewed for this CWRP. While SPUs have the potential to require additional training and maintenance duties for the KFD, the KFD should also consider lessons learned

from recent wildfire seasons, in which multiple, severe, interface wildfire incidents have occurred simultaneously across the province. In the future, increasingly severe wildfire seasons may result in suppression resource scarcity that makes relying on mutual aid resources an inappropriate emergency planning strategy.

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[10] City of Kelowna. (2016). *2016-2030 Kelowna Fire Department Strategic Plan.*

Table 21. Emergency planning recommendation and action items

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
To create specific wildfire response pre-incident plans so those responding to a wildfire emergency know who is available to help with what and when, and to improve Kelowna's ability to respond to (during and after) a wildfire emergency.							
EP1	High	Review back up power source options for all critical infrastructure.	Back-up power source availability for critical infrastructure is crucial for its continued functioning in the event that a wildfire results in power outages.	City of Kelowna (Kelowna Fire Department, Utilities)	1-3 years	Review completed	Local government funding
EP2	High	Complete, and participate in regular testing of, a wildfire incident preplan.	Testing the pre-plan could overlap with the multi-agency training exercises (table-top and in-person) recommended in Section 5.5: Cross-Training. In addition, consider engaging with other municipalities in the Okanagan that have completed a wildfire incident pre-plan (e.g., Penticton) to obtain information about relevant regional concerns.	City of Kelowna (Kelowna Fire Department, Parks Services)	1-3 years	Pre-plan completed	CRI funding
EP3	Moderate	Evaluate the utility of adopting a City-wide emergency alert app, or adopting an emergency alert feature into a City of Kelowna app if it is developed.	Municipal or regional emergency alert apps have been adopted by communities around the province and are one tool local governments can use to better communicate with residents in an emergency (e.g., severe weather, power outages, flooding, and road closures, as well as wildfire events). Promoting an emergency alert app indicates that the City is taking seriously the need to prepare for emergency events, and may prompt residents to also take this possibility seriously.	RDCO, consultant support	1 year	Evaluation completed	Local government funding
EP4	High	Complete a community water delivery assessment for suppression requirements across all five water purveyors.	Areas of the municipality are outside of hydrant coverage, and there are several natural areas and green spaces that may have insufficient or unreliable water supply.	City of Kelowna (Kelowna Fire Department, Utilities), other utility providers, consultant support	1-3 years	Assessment completed	CRI funding

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
EP5	Moderate	Based on the results of the fire flow and water availability assessment, evaluate the utility of installing dry hydrants in natural areas and acquiring lake water compatible pumps to support suppression response in more isolated areas of the municipality.	Areas of the municipality are outside of hydrant coverage, and there are several natural areas and green spaces that may have insufficient or unreliable water supply. The potential benefits of investment in new technologies to address these gaps should be evaluated. This evaluation should take place after the fire flow / community water availability assessment is complete, in order to identify target areas.	City of Kelowna (Kelowna Fire Department, Utilities), consultant support	1-3 years	Assessment completed	CRI funding

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
EP6	Moderate	Identify municipal buildings such as community centers or libraries as clean air shelters and promote their use during occurrences of poor air quality.	Exposure to smoke can affect residents' health.	City of Kelowna, RDCO	1-3 years	Number of social media posts or press releases	Local government funding
EP7	High	Evaluate the feasibility of obtaining a structural protection unit (SPU) for the City.	Kelowna Fire Department does not have a structural protection unit. In the event of a wildfire approaching an interface neighborhood the City could request a unit through the Province or potentially have a mutual aid partner supply one. However, as wildfire seasons are projected to increase in severity and intensity, it is increasingly probable for complex events to occur in which multiple neighborhoods or municipalities are affected simultaneously, in which case resources may become scarce and this strategy may no longer be appropriate. A cost benefit analysis should be conducted to re-evaluate this strategy considering the cost to obtain and maintain the SPU, maintain training requirements for fire department members, in comparison with the potentially increased frequency of use.	City of Kelowna (Kelowna Fire Department), consultant support	1 year	Evaluation completed	CRI funding, local government funding

EP8	High	Review, update, and regularly revise a Total Access Plan.	A Total Access Plan is an inventory of the trail and road network in interface and natural areas. The objective of this plan is to pre-plan access to natural areas for the purposes of fire suppression and identify areas with insufficient access. This plan should have a spatial data and/ or mapping component as well, for internal use as well as to share with BCWS or other fire suppression personnel. Some access planning information was previously compiled but not formalized. The Total Access Plan could be developed in the process of completing the wildfire incident pre-plan. Information regarding new developments completed in the past few years should be incorporated into this update.	City of Kelowna (Kelowna Fire Department, Parks Services), BCWS, consultant support	1-3 years	Total Access Plan completed	CRI funding, local government funding
EP10	High	Complete a City evacuation plan, drawing on the outcomes of the RCDO evacuation planning process (slated to occur 2021-2022).	There are several neighborhood locations within Kelowna with access and egress challenges (see SectionSECTION 5: FireSmart Principles - FireSmart Priority Neighborhoods), and these should be prioritized for evacuation planning completion.	City of Kelowna (Kelowna Fire Department, Parks Services), consultant support	1-3 years	Evacuation plan(s) completed	CRI funding

5.7 VEGETATION MANAGEMENT

The City has established a robust fuel treatment program to manage hazardous fuels within municipal parks by applying annually for UBCM grant funding to thin, prune and removal woody surface fuels in priority areas. Many forested areas of the city have received initial fuel mitigation treatments and will require ongoing maintenance over the coming years. A challenge going forward for the City of Kelowna is to track historical treatments, and ensure that the areas are revisited and re-treated on an appropriate timeline.

Grassland areas remain a hazard throughout the municipality. As noted in the 2016 CWPP, grass fires, though not as spectacular as crown fires, when wind-driven can have very rapid rates of spread and considerable flame height (up to 4 m) and are capable of igniting structures. Grass fires are capable of igniting structures in the interface, which subsequently release embers as they burn. Embers *Figure 6. Forest Fuel Reduction Project in Myra Bellevue* then can alight onto other structures further away, *Provincial Park* triggering a full interface fire event in which suppression resources are overwhelmed. Grass fires challenge the notion of rapid initial attack, as they have the capability to spread faster than the ability of crews to respond to the site, particularly when wind-driven.

The following observations made in the 2016 CWPP remain current:

- *Grassy fuels in open canopy stands pose a serious fire hazard in the study area and the hazard is generally underestimated;* ***thick, continuous flashy fuels (grasses) are one of the biggest fire hazards and operational challenges facing the City.***
- *Sites on northern and eastern aspects, and with higher site productivity, such as the Upper Canyon Open Space by the Wilden neighbourhood and parts of Dilworth Mountain, have thick, continuous, tall standing grasses which pose considerable hazard and could support a rapidly spreading surface fire capable of destroying nearby structures.*
- *Areas that were disturbed during development and subsequently re-seeded represent considerably higher grass hazard; these areas are generally 100% grass cover of thick,*

matted, non-native grass species often more than 1 m in height. A dryland, native grass mix should be used to stabilize and re-generate disturbed areas.

While the hazard has been well-documented and is understood by City staff, several barriers have prevented effective mitigation up to this point:

- Many of the hazardous areas are located on private land (e.g., hillslopes disturbed during development), and often any alteration of vegetation cover is prohibited by bylaw.
- Prescribed burning is scientifically accepted as an ecologically beneficial and cost-effective method to reduce grassland hazard but there is little public acceptance for this – and some areas where grass hazard is may be unsuitable regardless (e.g., located on private land, on very steep slopes, or in very close proximity to structures).
- Other management options also have costs and benefits. Targeted grazing, for example, may not be socially acceptable in all areas or be less preferable for conservation areas.
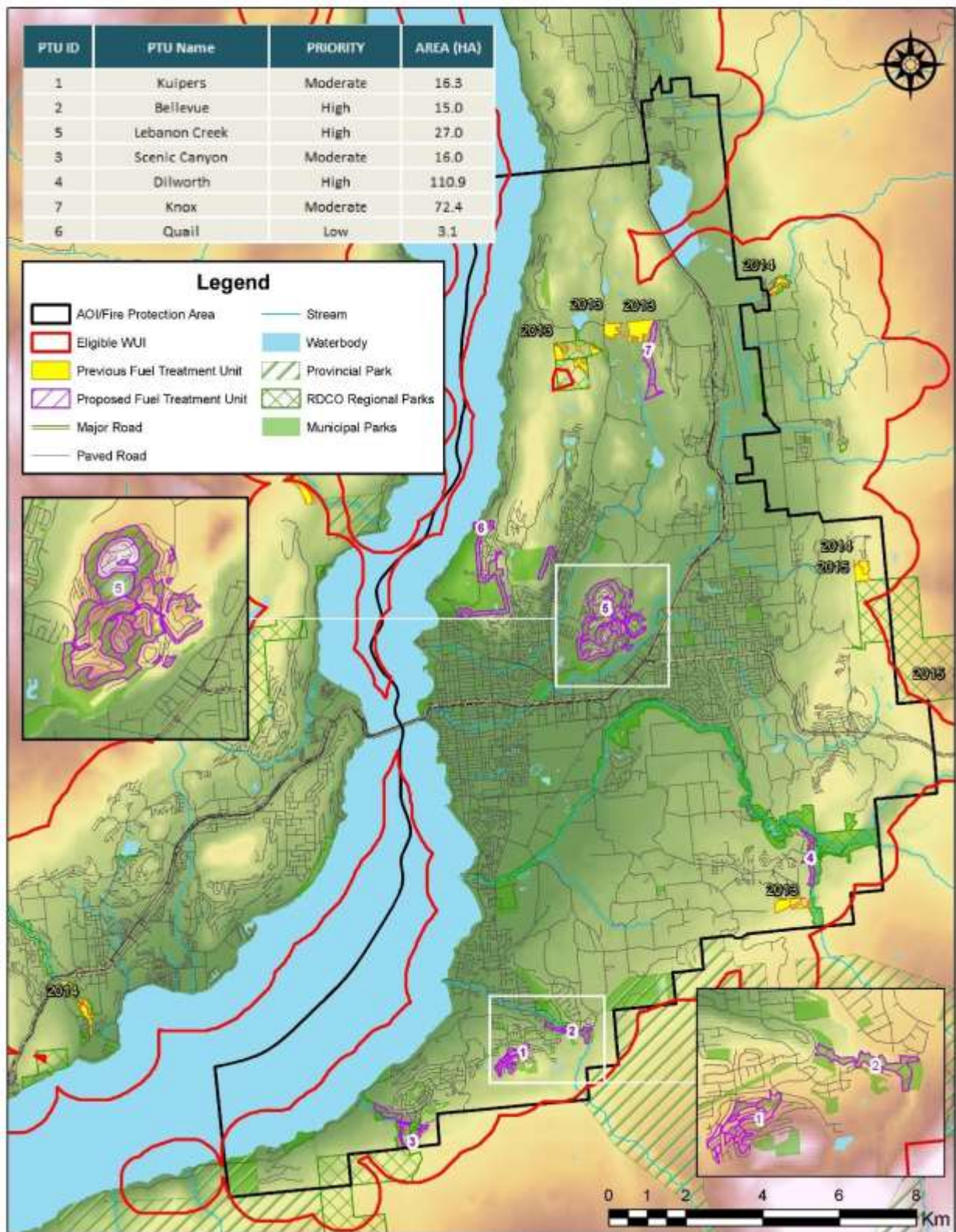
The 2016 CWPP describes the primary management options for grass fuels: prescribed burning, targeted grazing, herbicides / chemical treatment, or mechanical treatment. That summary remains current, and is briefly summarized again below:

Table 22. Summary of Grass Fuel Management Recommendations from the 2016 CWRP.

Targeted grazing	• • May be effective surface fuels control under some conditions Success of a grazing treatment depends on many variables, including, but not limited to: o availability of livestock species appropriate for the target vegetation o availability of qualified personnel to herd and manage the livestock to achieve desired results o livestock and personnel availability with the appropriate timing for surface fuel control for the target vegetation. • Site and weather conditions affect the vegetative response to grazing and can make the results of grazing difficult to anticipate • Site-specific grazing management plans should be developed and include: o detailed stocking levels o length of grazing periods o number of seasons required to achieve objectives o quantifiable criteria to measure effectiveness o invasive species management strategy

Herbicides / chemical treatment	- May be an effective and acceptable treatment option for aggressively invasive species or fast-growing vegetation which requires frequent re-treatment Success of implementation depends on: - accessibility to the treatment area - treatment area size ○ soil types - ecosystem sensitivity - proximity to water and other values at risk ○ effectiveness of herbicide on the target vegetation - Water quality concerns and other environmental and societal impacts that may occur with widespread or prolonged use of herbicides as a treatment option to reduce surface fuel continuity makes chemical treatment an unfeasible option for most circumstances in the study area. - Herbicides do not reduce the fuel load, so in the short and medium term, fire hazard may not be reduced or may actually increase.
Mechanical treatment	• Most effective at roadways or other linear corridors accessible by mowers. - Paired burns, comparing standing to mowed grass, shows significant decrease in fire behaviour (flame length and rate of spread).
Prescribed / cultural burning	- Most effective method to control fine and small fuels, help to maintain lower fuel loads, and to restore or maintain an ecosystem closer to its historically natural conditions - Limitations and risks include the following: - has little effect on larger diameter fuels ○ risk of fire escape - does not allow for discriminatory fuel reduction (fire burns biomass available) - smoke can be a health hazard, particularly as fire prescriptions tend toward high relative humidity and low wind speed conditions often associated with stagnant air masses - due to the risk of fire escape, fire managers often tend towards substantial fire personnel and equipment, which can result in higher implementation costs - However, in comparison with the costs and impacts of an uncontrolled wildfire: - proper prescribed burning methods and timing can minimize emissions ○ the timing of smoke emission is known, which allows for accommodation for those most seriously affected by smoke - in contrast, smoke emissions from uncontrolled wildfires are considerable, uncontrollable, and untimed.

Despite the known challenges, areas where grass management should be targeted are detailed in the following table and map.

PTU ID	PTU Name	PRIORITY	AREA (HA)
1	Kuipers	Moderate	16.3
2	Bellevue	High	15.0
5	Lebanon Creek	High	27.0
3	Scenic Canyon	Moderate	16.0
4	Dilworth	High	110.9
7	Knox	Moderate	72.4
6	Quail	Low	3.1

Map 14. Grass management proposed treatment units.

Table 23. Summary of Proposed Fuel Treatment Units (PTUs)

PTU ID	PTU Name	Total Area (ha)	Priority	Treatment Rationale
1	Kuipers	16.3	Moderate	This PTU is comprised of open forest with grassy understory (C-7) and grassland (O1-a/b) fuel types. It encompasses the open grassy areas located between clusters of residences in the Barnaby Road neighborhood, which is identified as a FireSmart Priority Neighborhood in Section 5: FireSmart Principles. Grass fuels are continuous from the bottom to the top of the slope on which this neighborhood is located through a network of natural areas. Homes are located at bottom-, mid-, and top-of-slope sites. This PTU is adjacent to private land that is currently undeveloped or in initial construction stages. As a result, in the short to medium term it extends from the continuous tracts of forest and wildlands in Okanagan Mountain Park.
2	Bellevue	15.04	High	This PTU is comprised predominantly of an open forest with grassy understory (C-7) fuel type. It is located to close to an area proposed for treatment under the 2020 RCDO Parks CWPP. The area proposed for treatment under the RCDO Parks CWPP, but not this CWRP, is comprised of dense, juvenile stands with continuous ladder fuels, and a less continuous grassy understory and are less suitable for grass-specific fuel management. This PTU is adjacent to private land that is currently undeveloped or in initial neighborhood construction stages. As a result, in the short to medium term it extends from the continuous tracts of forest and wildlands in Okanagan Mountain Park, into neighborhoods closer to the downtown and waterfront areas of the city. This heightens the risk of fire entering the neighborhood from, or igniting in the interface and spreading to, the more volatile forested fuel types within the park. This PTU encompass the ravine leading into Bellevue Creek. Homes are located on the top of slopes on either side, which increases the risk of adverse wildfire impacts to residents (steep slopes accelerate the rate of spread - see Section 4.1.1 Topography). This area is identified in Section 5: FireSmart Principles as a priority FireSmart neighborhood.
3	Lebanon Creek	27.02	High	This PTU is comprised of grassland (O1-a/b) and open forest with grassy understory (C-7) fuel types. It encompasses a network of ravines with steep slopes that are intermixed between clusters of homes in the adjacent neighborhood (identified as a FireSmart Priority Neighborhood in Section 5: FireSmart Principles). Homes in these neighborhoods are situated at the top of slopes, which increases the risk of adverse wildfire impacts to residents (steep slopes accelerate the rate of spread - see Section 4.1.1 Topography). The proposed treatment area extends outwards into continuous tracts of forest and wildlands in Okanagan Mountain Park. This heightens the risk of fire entering the neighborhood from, or igniting in the interface and spreading to, the more volatile forested fuel types within the park. This proposed treatment unit overlaps with an area proposed for treatment under the 2020 RCDO Parks CWPP.[11]
4	Scenic Canyon	16.0	High	This PTU is comprised of open forest with grassy understory (C-7) and grassland (O1-a/b) fuel types. It encompasses the steep ravine slopes or "canyon" for which the park is named. This PTU is located adjacent to Gallagher's Canyon (identified as a FireSmart Priority Neighborhood in Section 5: FireSmart Principles) on slopes below these residences. The proposed treatment area extends outwards into continuous tracts of forest and wildlands in adjacent Crown Land and the nearby Myra Bellevue Park. This heightens the risk of fire entering the neighborhood from, or igniting in the interface and spreading to, the more volatile forested fuel types within the park. This PTU also abuts and overlaps an area proposed for treatment under the 2020 RCDO Parks CWPP.[25]

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[11] The same area is proposed twice, because the treatment and rationale for grassy fuels reduction will be distinct from the conventional thinning, pruning, and surface fuel removal proposed in the 2020 RCDO Parks CWPP.

| 5 | Dilworth | 110.9 | High | This PTU is comprised predominantly of an open forest with grassy understory (C-7) fuel type. It encompasses the open grassy areas located between clusters of residences in the Dilworth neighborhood, (identified as a FireSmart Priority Neighborhood in Section 5: FireSmart Principles). Grass fuels are continuous from the bottom to the top of the hill on which this neighborhood is located through a network of natural areas. Homes are located both above and below |

PTU ID	PTU Name	Total Area (ha)	Priority	Treatment Rationale
				the slopes on which this PTU is located. A rapidly spreading grass fire occurred in this neighborhood in 2021. Treatment of grass fuels in this location would aim to reduce the rate of spread in the event of a similar occurrence.
6	Knox	72.4	High	This PTU is comprised predominantly of an open forest with grassy understory (C-7) fuel type. It encompasses a 100-metre buffer against neighborhoods on the edge of Knox and Knox East parks. It overlaps previous and planned treatments by the City of Kelowna reduce wildfire risk within forested areas. Past treatments, however, did not specifically target grass fuel hazards. This PTU is located on slopes below residences in the Magic Estates neighborhood. While accumulations of hazardous fuels may exist throughout Knox Mountain Park (identified in the Local Fire Threat map in Section 4.3 Local Wildfire Threat) this PTU is strategically located to increase the defensible space closest to homes, which in combination with neighborhood-level FireSmart efforts, will support wildfire resiliency for residents.
7	Quail	3.1	Low	This PTU is comprised of an open forest with grassy understory (C-7) fuel type. It is located adjacent to the Quail Ridge neighborhood (identified as a FireSmart Priority Neighborhood in Section 5: FireSmart Principles). This PTU abuts continuous tracts of forested and wildland areas, which are located on private land. This heightens the risk of fire entering the neighborhood from, or igniting in the interface and spreading to, these areas for which the degree of wildfire risk is unknown.

Table 24. Vegetation management action items

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
Objective: reduce the potential wildfire intensity and ember exposure to people, infrastructure, structures, and other values through manipulation of both the natural and cultivated vegetation that is within or adjacent to a community.							
V1	High	Maintain or expand the current fuel treatment program, for both forest and grass fuels.	The Parks Services department currently has sufficient in-house expertise to prioritize areas of municipal land for treatment, effectively reducing patches of hazardous fuels. Allocating a percentage of the City's operating budget towards fuel management would allow this program to expand and enable the City to leverage grant funding for novel community wildfire resiliency projects (e.g. hiring a FireSmart Coordinator and expanding FireSmart education programs). Additional support could be achieved by obtaining funding to hire student crews (e.g. through Canada Summer Jobs grants) to complete lightduty fuel treatment work in interface neighborhoods or municipal parks. A detailed description of the different methods available for treating grass hazard is found in the 2016 CWPP and remains current. It is briefly re-summarized in this document.	City of Kelowna (Parks Services)	Ongoing	Number of sites treated per year maintained or expanded	CRI funding and / or local government funding
V2	Moderate	Offer support for residents to dispose of flammable debris and vegetation from FireSmart landscaping initiatives on private property.	This could occur through maintaining or expanding the community chipping program (planned for 2022). In other municipalities, temporarily installing large bins on request from residents who want to complete landscaping work has also been an effective way of facilitating FireSmart landscaping.	City of Kelowna (Parks Services, potential FireSmart Coordinator)	1-3 years	Community chipping program offered periodically and bin installation program offered annually	CRI funding and / or local government funding
V3	Low	Continue to track information on completed fuel treatments within the City of Kelowna.	Information on fuel treatments should be tracked through a spatial layer. Projects carried out by the City, as well as on private land by developers should be included in this dataset. Consider tracking the following attributes of fuel treatments: agency who supervised work, date of treatment, method of treatment and debris disposal, and date for re-assessment.	City of Kelowna (Parks Services, potential FireSmart Coordinator)	Ongoing	Spatial and databases updated frequently	CRI funding and / or local government funding

Item #	Priority	Recommendation	Comments	Lead	Timeframe	Metric for Success	Funding Source
V4	Low	Monitor treatment effects from the surface fuel reduction grazing	Gathering information about the outcome of this treatment will help support a cost-benefit analysis of replicating it at other sites.	City of Kelowna, VOSS, BCWS	1-3 years	Assessment completed	Local government funding
		trial in south Kelowna (scheduled for 2022).					

SECTION 6: APPENDICES

6.1 APPENDIX A: LOCAL WILDFIRE RISK PROCESS

6.1.1 APPENDIX A-1: FIRE RISK THREAT ASSESSMENT METHODOLOGY

The Canadian Forest Fire Behaviour Prediction (FBP) System outlines five major fuel groups and sixteen fuel types based on characteristic fire behaviour under defined conditions.[26] Fuel typing is recognized as a blend of art and science. Although a subjective process, the most appropriate fuel type was assigned based on research, experience, and practical knowledge; this system has been used within BC, with continual improvement and refinement, for 20 years.[27] It should be noted that there are significant limitations with the fuel typing system which should be recognized. Major limitations include: a fuel typing system designed to describe fuels which sometimes do not occur within the AOI, fuel types which cannot accurately capture the natural variability within a polygon, and limitations in the data used to create initial fuel types.[27] There are several implications of the aforementioned limitations, which include: fuel typing further from the developed areas of the study has a lower confidence, generally; and, fuel typing should be used as a starting point for more detailed assessments and as an indicator of overall wildfire risk, not as an operational, or site-level, assessment. Forested ecosystems are dynamic and change over time: fuels accumulate, stands fill in with regeneration, and forest health outbreaks occur. Regular monitoring of fuel types and wildfire risk assessment should occur every 5 – 10 years to determine the need for threat assessment updates and the timing for their implementation.

Table 25 summarizes the fuel types by general fire behaviour (crown fire and spotting potential). These fuel types were used to guide the threat assessment

Table 25. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the WUI are provided (as such, other fuel types, i.e., C-1, C-2, C-4, S-2, and S-3 are not summarized below).

Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
C-3	Mature jack or lodgepole pine	Fully stocked, late young forest (Douglas fir, hemlock, cedar), with crowns separated from the ground	Surface and crown fire, low to very high fire intensity and rate of spread	High*

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

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

Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
C-7	Ponderosa pine and Douglas-fir	Low-density, uneven-aged forest, crowns separated from the ground, understory of discontinuous grasses and shrubs. Exposed bed rock and low surface fuel loading.	Surface fire spread, torching of individual trees, rarely crowning (usually limited to slopes > 30%), moderate to high intensity and rate of spread	Moderate
O-1a/b	Grass	Matted and standing grass communities; sparse or scattered shrubs, trees and down woody debris. Seasonal wetlands that have the potential to cure.	Rapidly spreading, high-intensity surface fire when cured	Low
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels; areas harvested 10-20 years ago	Surface fire spread, torching of individual trees and intermittent crowning, (depending on slope and percent conifer)	<26% conifer (Very Low); 26-49% Conifer (Low); >50% Conifer (Moderate)
D-1/2	Aspen (leafless and green)	Deciduous stands	Always a surface fire, low to moderate rate of spread and fire intensity	Low
S-1	Slash (jack / lodgepole pine, white spruce)	Any conifer slash	Moderate to high rate of spread and high to very high intensity surface fire	Low
W	N/A	Water	N/A	N/A
N	N/A	Non-fuel: irrigated agricultural fields, golf courses, alpine areas void or nearly void of vegetation, urban or developed areas void or nearly void of forested vegetation	N/A	N/A

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

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

Table 26. Proximity to the Interface.

Proximity to the Interface	Descriptor*	Explanation

WUI 100 *HIZ/CIIZ and Community Zones*	(0-100 m)	This Zone is always located adjacent to the value at risk. Treatment would modify the wildfire behaviour near or adjacent to the value. Treatment effectiveness would be increased when the value is FireSmart.
WUI 500 *Community and Landscape Zones*	(100-500m)	Treatment would affect wildfire behaviour approaching a value, as well as the wildfire's ability to impact the value with short- to medium- range spotting; should also provide suppression opportunities near a value.
WUI 1000	(500-1000 m)	Treatment would be effective in limiting long - range spotting but short- range spotting may fall short of the value and cause a new ignition that could affect a value.
Proximity to the Interface	**Descriptor***	**Explanation**
Landscape Zone		
Landscape Zone	>1000 m	This should form part of a landscape assessment and is generally not part of the zoning process. Treatment is relatively ineffective for threat mitigation to a value, unless used to form a part of a larger fuel break / treatment.

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

6.1.3 APPENDIX A-3: FIRE SPREAD PATTERNS

ISI roses can help plan the location of fuel treatments on the landscape to protect values at risk based on the predominant wind direction and frequency of higher ISI values. Potential treatment areas were identified and prioritized with the predominant wind direction in mind. Figure 7 below displays the daily average ISI values for the Fintry fire weather station, which is located about 15 kilometers southeast of Vernon, on the east side of Okanagan Lake. During the fire season (April – October) winds originate predominantly from the south and southeast, becoming more dominant in August and September. High windspeeds are more likely to be recorded in July and August.
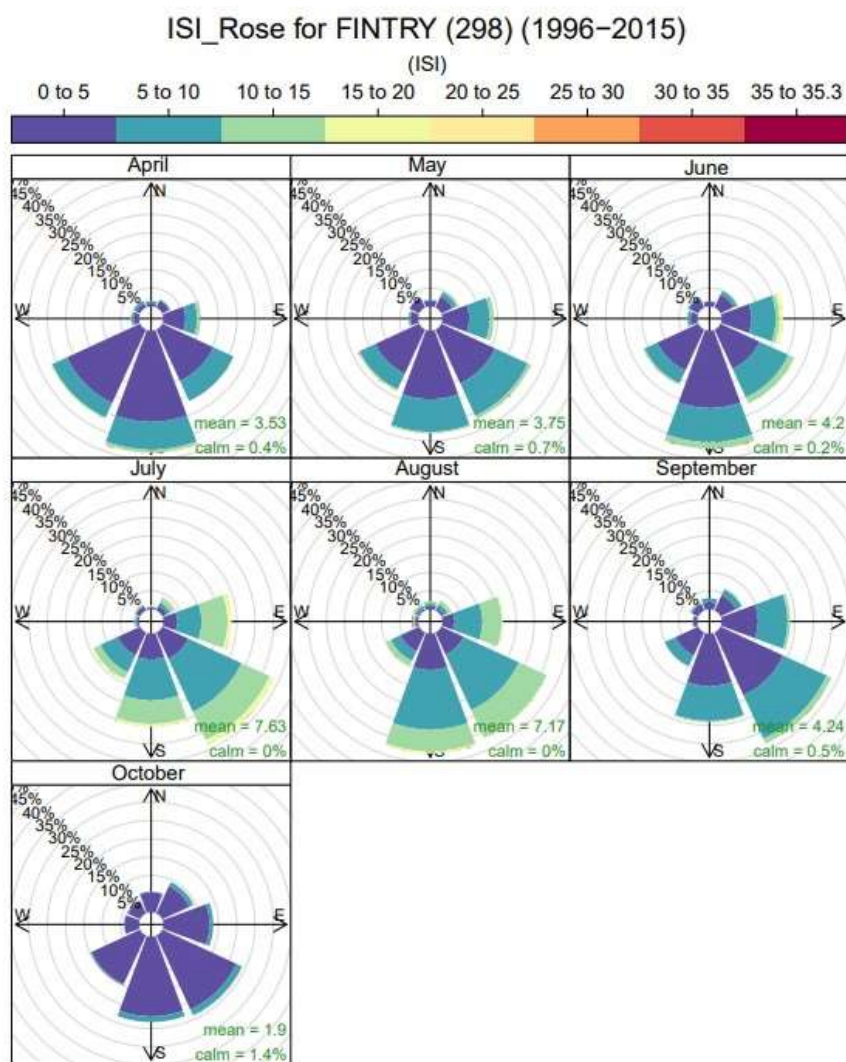
Figure 7. Initial Spread Index (ISI) roses depicting average daily wind speed and direction for each month during the fire season (April – October). Data taken from Fintry fire weather station, 1996 – 2015.

6.2 APPENDIX B: MAPS

Provided separately as PDF package.

6.3 APPENDIX C: SAMPLE JOB PROFILE - FIRESMART COORDINATOR

6.3.1 JOB SUMMARY

The [City of Kelowna/Kelowna Fire Department (KFD)] is looking to recruit a full-time FireSmart Coordinator. This position will liaise between various City departments and the KFD, in order to provide the residents of Kelowna with a comprehensive and effective FireSmart program. This position will aim to create a more educated and motivated public with regard to wildfire prevention principles, design community-driven programs to perform risk mitigation works, and will capitalize on available local, provincial and national funding programs to ensure the continued delivery of the program.

6.3.2 JOB RESPONSIBILITIES

The role of a FireSmart coordinator allows for flexibility and creativity in deciding how the program is best delivered, but may include the following roles:

- Providing continued education to residents regarding FireSmart principles, mitigation efforts within the City of Kelowna, and steps that homeowners can take to reduce the risk of wildfire on their properties.
- Designing neighbourhood programs to assist with fuel management efforts at the home and neighbourhood level. Ideas include providing temporary debris disposal bins, scheduling chipper days with neighbourhoods to collect and remove debris, and/or scheduling neighbourhood work days to oversee and coordinate risk reduction efforts.
- Overseeing and expanding the FireSmart Home Assessment program and creating a database to better organize the assessment efforts within the City.
- Designing and implementing incentive programs to assist homeowners with wildfire mitigation efforts, including, but not limited to: FireSmart Rebate Program and sprinkler program.
- Working with educators to ensure that material from the FireSmart Education Box is being presented through all grade levels in Kelowna schools.

6.3.3 JOB SKILLS & QUALIFICATIONS

The responsibilities of a FireSmart Coordinator involve aspects of wildfire prevention due to either structure fires or wildfire, and may involve recommendations on large parcels of natural land. Therefore, it is preferred that a successful candidate demonstrate the following:

- Knowledge of the seven FireSmart disciplines and certification as a Local FireSmart Representative
  (LFR) and/or a Qualified Assessor under the Home Partners Program;
- Experience in wildfire mitigation programs at the home and forest level;
- Experience in wildfire suppression and/or structure protection;
- Registration or eligibility for registration with the Association of BC Forest Professionals (ABCFP) and/or certification with the International Society of Arboriculture (ISA);
- Experience with funding applications, budget estimation and budget administration;
- A motivated and creative attitude, with a genuine desire to protect the residents of Kelowna from an ever-increasing risk of wildfire.