Community Wildfire Protection Plan

Community of Willis Point

Considerations for Wildland Urban Interface Management

WILLIS POINT

COMMUNITY WILDFIRE PROTECTION PLAN

Considerations for Wildland Urban Interface Management for Willis Point, British Columbia

Submitted by:

Amelia Needoba
Bruce Blackwell & Babita Bains
B.A. Blackwell and Associates Ltd.
3087 Hoskins Road
North Vancouver, B.C.
V7J 3B5

Submitted to:

Travis Whiting
Senior Manager, Protective Services
Capital Regional District
625 Fisgard St., Victoria, BC, V8W 2S6

B.A. Blackwell & Associates Ltd.

RPF PRINTED NAME		Registered Professional Foresters Signature and Seal
Bruce A. Blackwell	RPF 2073	
DATE SIGNED		
I certify that I have reviewed this document and I have determined that this work has been done to standards acceptable of a Registered Professional Forester.		

Table of Contents

List of Figures

List of Maps

List of Tables

1.0 Introduction

In 2010 B.A. Blackwell & Associates Ltd. were retained by the Capital Regional District (CRD) and the District of Sooke to develop Community Wildfire Protection Plans (CWPPs) for Sooke, the Juan de Fuca Electoral Area communities and Piers Island. 'FireSmart – Protecting Your Community from Wildfire'[1] was used to guide the protection planning process. For Willis Point, the assessment considered important elements of community wildfire protection including communication and education, structure protection, emergency response and vegetation management.

The social, economic and environmental losses associated with the 2003 and 2009 fire seasons emphasized the need for greater consideration and due diligence in regard to wildfire risk in the wildland urban interface (WUI). In considering wildfire risk in the WUI, it is important to understand the specific risk profile of a given community, which can be defined by the probability and the associated consequence of wildfire to the community. While the probability of fire in coastal communities is substantially lower when compared to the interior of British Columbia (BC), the consequences of a large fire are likely to be very significant in these communities given access and evacuation constraints, population size (especially during summer months), values at risk, topography and environmental considerations.

This CWPP will provide Willis Point with a framework to assess the District's fire risk. Additionally, the information contained in this report will help to guide the mitigation strategies that will best address wildfire risk in the community.

The scope of this project included three distinct phases of work:

- **Phase I** –Assess fire risk and develop a Wildfire Risk Management System (WRMS) to spatially quantify the probability and consequence of fire.
- **Phase II –** Conduct a structured decision making workshop to define each community's most important objectives for wildfire protection, and to develop the mitigation strategy alternatives that would best meet community needs.
- **Phase III –** Develop the Plan, which outlines measures to mitigate the identified risk through communication and education, structure protection, emergency response and vegetation management.

[1] Partners in Protection. 2004. FireSmart Protecting your Community from Wildfire. http://www.partnersinprotection.ab.ca/downloads/index.php

2.0 Willis Point

2.1 Study Area

Willis Point is one of several unincorporated communities that make-up the Juan de Fuca Electoral Area, which is under the jurisdiction of the CRD. It is located on the south-eastern portion of Vancouver Island, and is approximately 23 km north of Victoria off of Highway 17A (Figure 1).

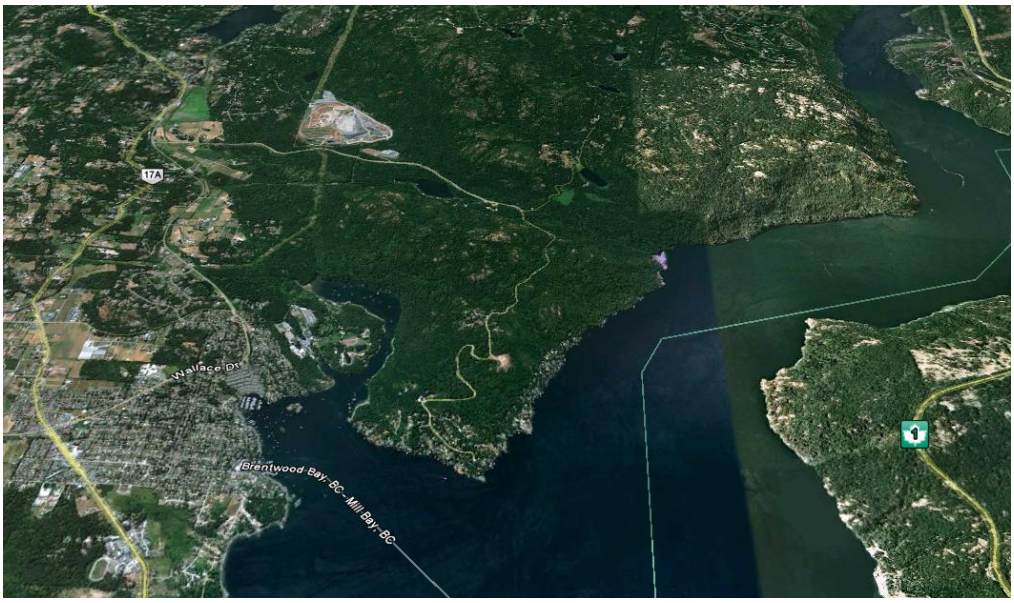


Figure 1. Google Map image of Willis Point and surrounding areas.

Willis Point is on the east part of Saanich Inlet. Approximately 46% of Willis Point is regional or provincial park land (Figure 2). Furthermore, a large part of the area is undeveloped or vacant forested parcels. The topography of Willis Point is quite rugged with steep slopes, rocky terrain and winding roads. The Willis Point Fire Protection Service Area is a total of 279 ha.

2.2 Population and Infrastructure

Willis Point in is one of several unincorporated communities that make-up the Juan de Fuca Electoral Area, which is under the jurisdiction of the CRD. The Juan de Fuca Electoral Area covers over 1,500 km^2 and is home to approximately 4,500 residents.There is a well-established community in Willis Point with approximately 150 dwelling and 450

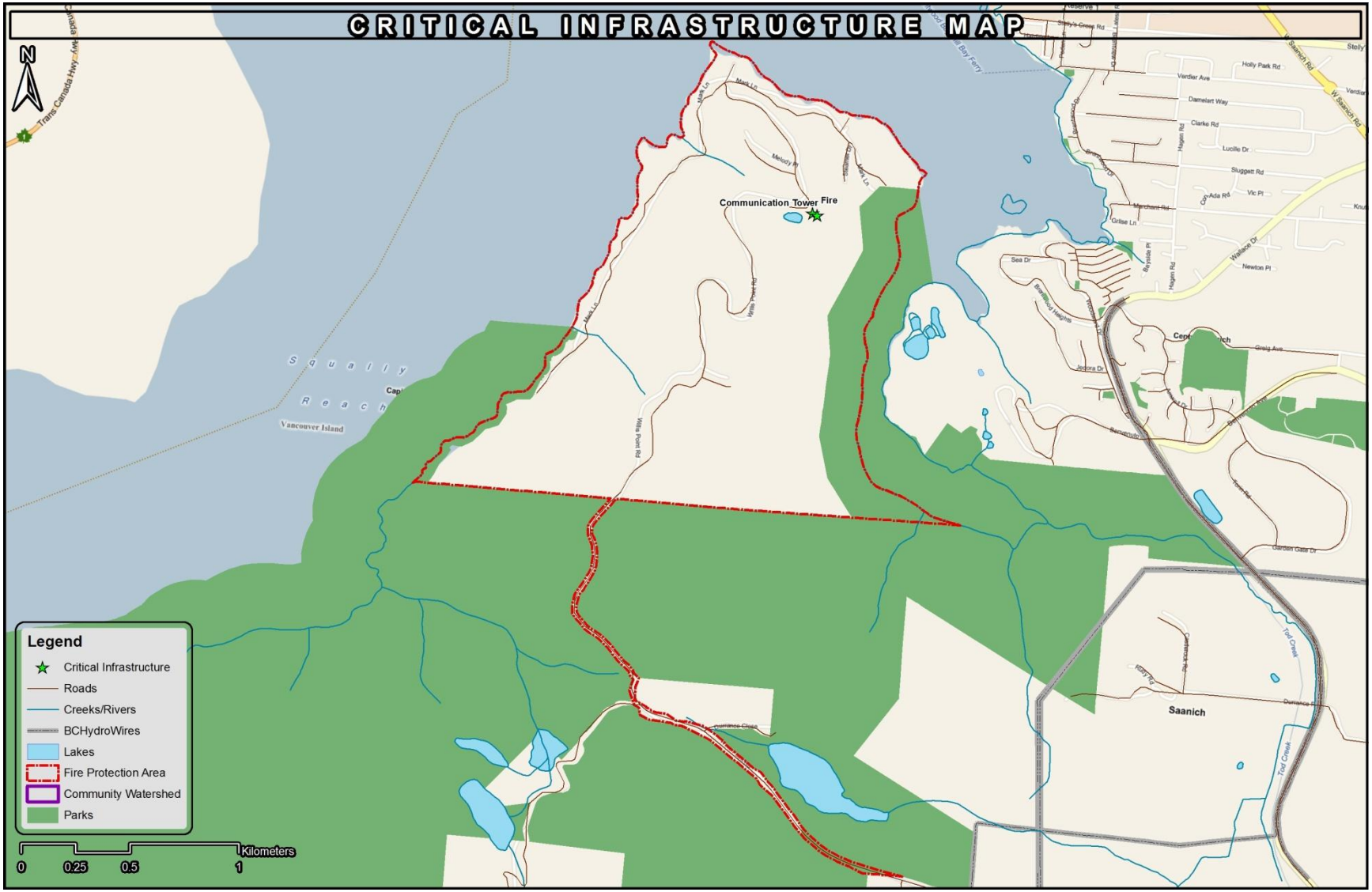
Figure 2. Willis Point access to Gowlland Tod Provincial Park.

residents. Willis Point has developed from a water-access only, primarily seasonal community in the 1930s to a road accessible, primarily permanent resident community today. However, the topography and adjacent Provincial Park have limited growth in Willis Point and isolated the community from surrounding developed areas. Economic activity in the community is limited to home-based businesses with further development not preferred. Some residents commute to Victoria or adjacent communities for work.

The infrastructure within Willis Point is limited with no schools or hospitals. The nearest hospital is the Saanich Peninsula Hospital which is approximately 9 km away on Highway 17A. The community has a fire department (Figure 3), which provides the foundation for incident command and response during an emergency, with 21 full-time members, 2 recruits and 1 junior member. Department volunteers have some interface and incident command training. Critical infrastructure is shown in Map 1.

The Willis Point community depends on a well system for water. Electrical services are delivered through wood pole transmission supplied by BC Hydro. Telephone lines are located on the same poles. Fire could cause a disruption in power and phone services either due to heat from the flames or fallen trees associated with a fire event. Cell phone coverage for the area is reliable and there is a communication tower adjacent to the fire hall (Figure 3).

Figure 3. Fire hall and community centre with water tank and communication tower in the background (left) and main access to fire hall (right).



Map 1. Critical Infrastructure within the Willis Point Fire Protection Area.

2.3 Environmental and Cultural Values

The Biogeoclimatic Ecosystem Classification (BEC) system describes zones by vegetation, soils and climate. Regional subzones are derived from relative precipitation and temperature. Willis Point is defined by the regional climate of the Coastal Douglas-fir moist maritime subzone (CDFmm). The CDFmm is restricted to a small part of southeastern Vancouver Island, the Gulf Islands and the perimeter of mainland along Georgia Straight. This zone is in the rain shadow of Vancouver Island and the Olympic Mountains; hence summers are typically warm and dry, and the winters are mild and wet. The mean annual precipitation for the CDFmm typically varies between 647 and 1,263 mm, primarily in the form of rain. The mean annual temperature ranges from 9.2 – 10.5^{0}C, with temperatures rarely falling below freezing.

There are various environmental and cultural values that are significant in the CDFmm. Vegetation within the CDFmm accounts for approximately 50 rare species, which occur only in this zone. Encroaching urban development throughout most of the zone and invasive species such as Scotch broom (Figure 4) and Himalayan blackberry are threatening these important and unique ecosystems[2].

Figure 4. Invasive Scotch Broom

Environmental values are high in Willis Point. The study area consists of critical Garry Oak habitat on rocky outcroppings and a number of blue and red listed species. Some of the listed species include the Western screech owl, giant chain fern and Propertius duskywing. Critical stands with Douglas-fir, western red cedar and grand fir have also been identified.

[2] http://www.for.gov.bc.ca/hfd/pubs/docs/Srs/Srs06/chap5.pdf

3.0 Fire Environment

3.1 Fire Weather

The Canadian Forestry Service developed the Canadian Forest Fire Danger Rating System (CFFDRS) to assess fire danger and potential fire behaviour. A network of fire weather stations during the fire season are maintained by the Ministry of Forests and Range (MOFR) and are used to determine fire danger on forestlands within a community. The information can be obtained from the MOFR Protection Branch and is most commonly utilized by municipalities and regional districts to monitor fire weather, and to determine hazard ratings, associated fire bans and closures. The Salt Spring Island weather station was used to summarize fire weather for Willis Point. The key fire weather parameters summarized are:

- Drought Code: The Drought Code represents the moisture in deep, compact organic matter with a nominal depth of about 18 cm and a dry fuel load of 25 kg/m^2. It is a measure of long-term drought as it relates to fire behaviour.

- Danger Class: The Danger Class Rating is derived from fire weather indices and has 5 classes: 1) Very Low Danger; 2) Low Danger; 3) Moderate Danger; 4) High Danger; and 5) Extreme Danger.

The drought code provides some indication of seasonal drought effects on forest fuels. The higher the drought code, the drier the duff (layer of decomposing organic materials below the litter layer), indicating a prolonged period without adequate moisture input to wet the duff layer. This code also give some indication of likely fire severity in terms of duff consumption – the drier the duff, the more will be consumed by the fire. The depth of burn can result in greater tree mortality and seed bank consumption due to soil heating. Soil heating can also result in soil hydrophobicity, meaning the soil repels water, and this has been linked with increased erosion post-fire due to increased water run-off. Figure 5 shows that the drought code tends to shift over the summer months and in to the fall from being predominantly moderate in June, to high in July and then extreme in August and September.

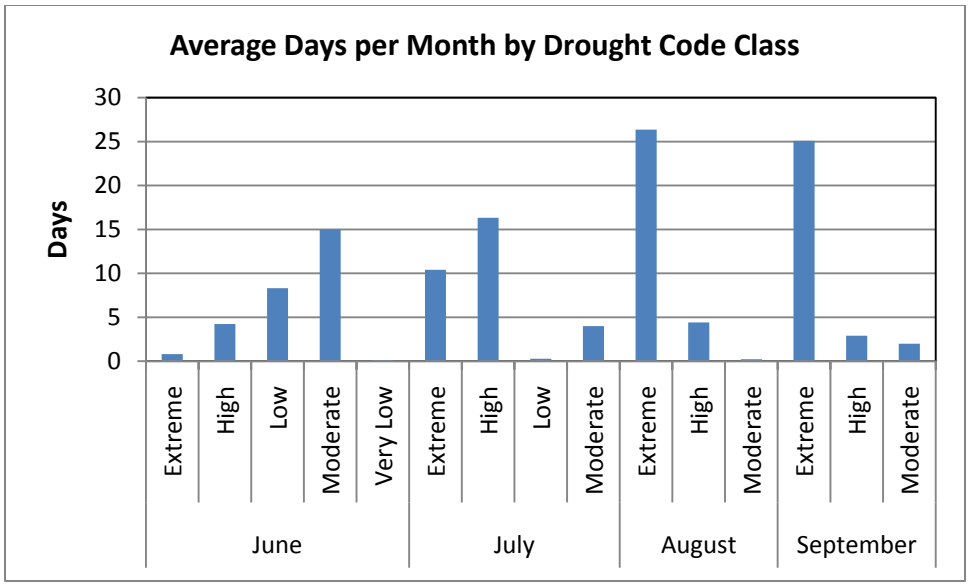


Figure 5. Drought code averaged for each month over a 22 year period from the Salt Spring Island weather station (Very low = 0-79; Low = 80-189; Moderate = 190-299; High = 300-424, Extreme = >425).

The Fire Danger classes provide a relative index of how easy it is to ignite a fire and how difficult control is likely to be. The BC *Wildfire Act* [SBC 2004] and *Wildfire Regulation* [B.C. Reg. 38/2005], which specify responsibilities and obligations with respect to fire use, prevention, control and rehabilitation, restrict high risk activities based on these classes. Fire Danger Classes are defined as follows:

Class 1 (Low) – Fires likely to be self-extinguishing and new ignitions unlikely. Any existing fires limited to smouldering in deep, drier layers.

Class 2 (Moderate) – Creeping or gentle surface fires. Fires easily contained by ground crews with pumps and hand tools.

Class 3 (High) – Moderate to vigorous surface fire with intermittent crown involvement. Challenging for ground crews to handle; heavy equipment (bulldozers, tanker trucks, aircraft) often required to contain fire.

Class 4 (Very High) – High-intensity fire with partial to full crown involvement. Head fire conditions beyond the ability of ground crews; air attack with retardant required to effectively attack fire's head.

Class 5 (Extreme) – Fast-spreading, high-intensity crown fire. Very difficult to control. Suppression actions limited to flanks, with only indirect actions possible against the fire's head.

Figure 6 shows that the number of danger class days on average for each month of the fire season is highly variable but that the number of high, very high and extreme danger class days tends to be highest from July through to September.

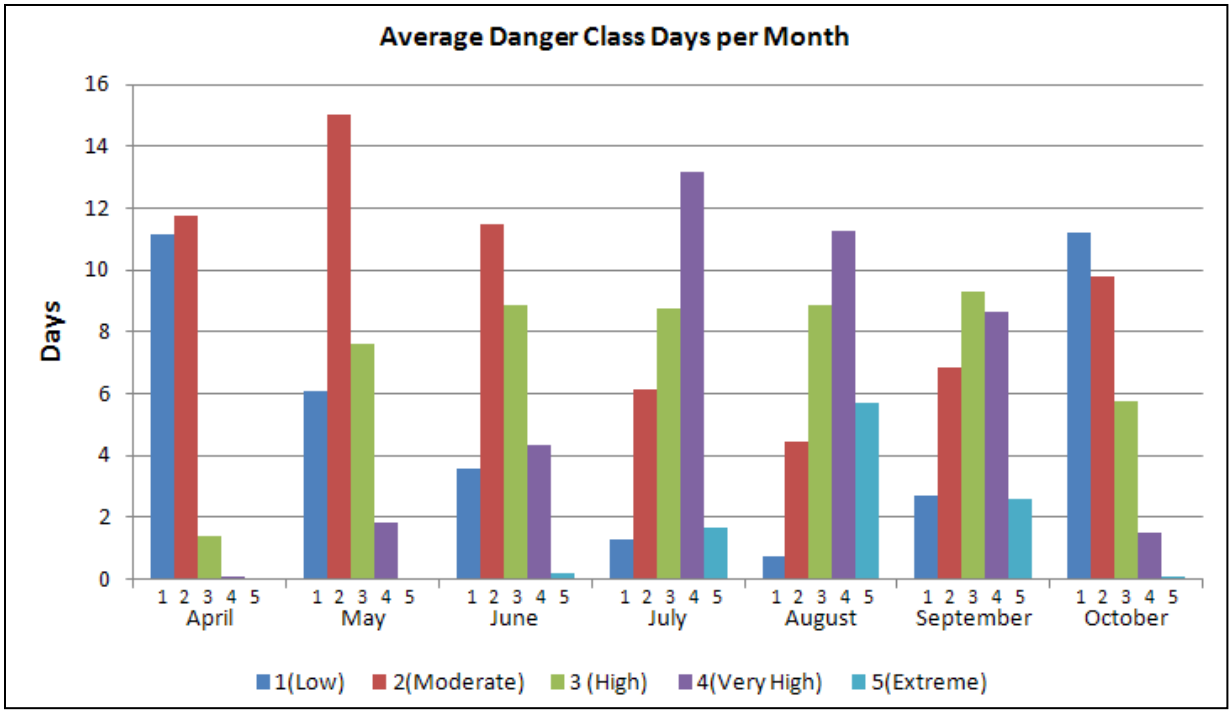


Figure 6. Fire Danger Class averaged for each month over a 22 year period from the Salt Spring Island weather station.

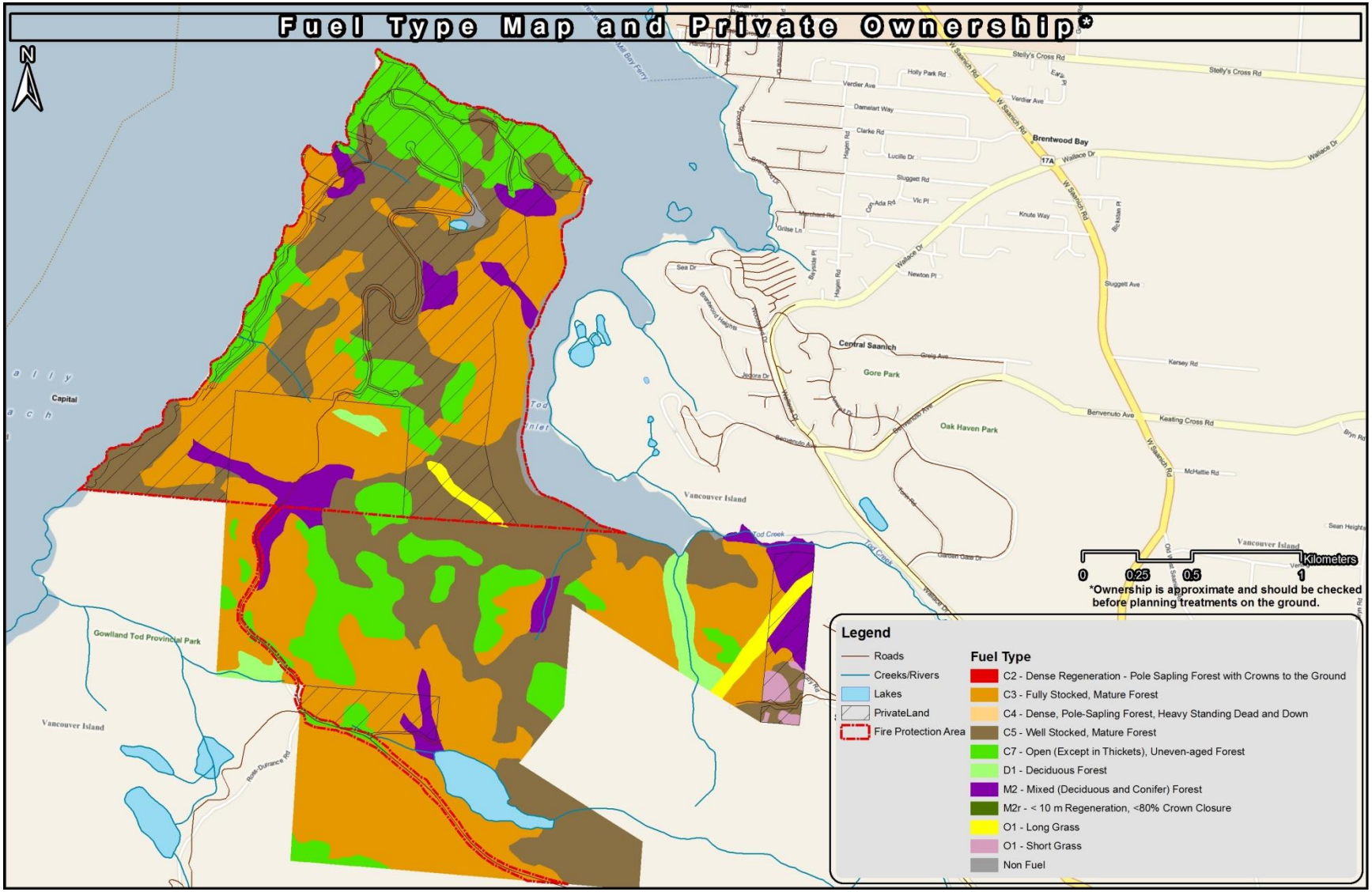
3.2 Fuels

Fuel types are generated spatially for the study area using an algorithm that assigns CFFDRS fuel types based on Vegetation Resource Inventory (VRI) data. The fuel types within the study area and the composition for each fuel type are outlined in Table 1. The algorithm uses BEC, species mix, crown closure, age, and non-forest descriptors to assign fuel type. Typically, the outputs require refinement and do not adequately describe the variation in fuels present within a given area, due to errors in VRI and adjustments required in the algorithm. For this reason, it is important to ground-truth fuel types in order to modify the algorithm and improve fuel type accuracy. The VRI-based fuel typing was improved upon and adjusted to incorporate local variation and is illustrated in Map 2.

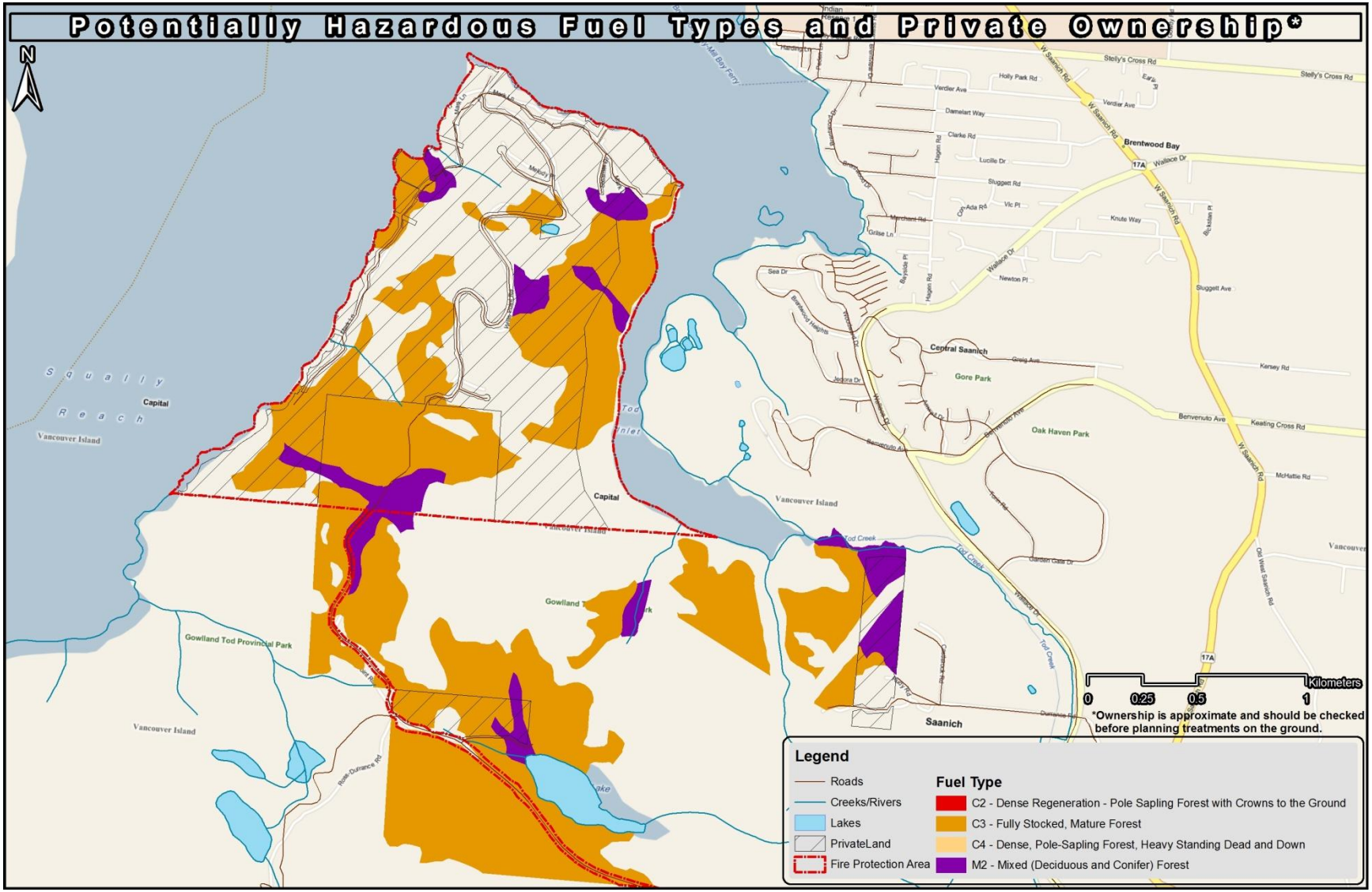
Table 1 summarizes the fuel types by general fire behaviour and total area for Willis Point. In general the fuel types considered hazardous in terms of dangerous fire behavior and spotting (lofting burning embers) are C2, C4, and C3. Hazardous fuel types are shown in Map 3.

Table 1. Fuel types, associated hazard, and areas in the Willis Point study area.

Fuel Type	Description	Wildfire Behaviour under High Wildfire Danger Level	Area (ha)	Percent
C2	Dense regeneration to pole-sapling forest with crowns almost to the ground	Almost always **crown fire**, high to very high fire intensity and rate of spread	0	0
C3	Fully stocked, mature forest, crowns separated from ground	**Surface and crown fire**, low to very high fire intensity and rate of spread	107.2	39
C4	Dense, pole-sapling forest, heavy standing dead and down, dead woody fuel, continuous vertical crown fuel continuity	Almost always **crown fire**, high to very high fire intensity and rate of spread	0	0
C5	Well stocked, mature forest, crowns well separated from ground	Low to moderately fast spreading, low to moderate intensity **surface fire**	93.0	34
C7	Open, uneven-aged forest, crowns separated from ground except in conifer thickets, understory of discontinuous grasses, herbs	**Surface, torching, rarely crowning** (slopes > 30%), moderate to high intensity and rate of spread	53.9	20
D1	Moderately well-stocked deciduous stands	Always a **surface fire**, low to moderate rate of spread and fire intensity	1.4	<1
M2	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels, crowns nearly to the ground	**Surface, torching and crowning**, moderate to very high intensity and spread rate (depending on slope and percent conifer)	17.4	6
M2r	Moderately well-stocked mixed stand of conifers and deciduous species regeneration, crowns nearly to the ground	**Surface, torching and crowning**, moderate to very high intensity and spread rate(depending on slope and percent conifer)	0	0
O1 – Long	Continuous standing grass, fuel loading is 0.3 kg/m2, 90% cured	Rapid spreading, moderate to high intensity **surface fire**	2.1	<1
O1 – Short	Continuous human modified short grass, fuel loading is 0.17 kg/m2, 90% cured	Rapid spreading, low to moderate intensity **surface fire**	0	0
		Total:	275.0	



Map 2. Fuel typing and private ownership for the Willis Point Fire Protection Service Area.



Map 3. Potentially hazardous fuel types within the Willis Point Fire Protection Service Area.

3.3 Historic Ignitions

Fire data are summarized by fire cause for the period of 1919 to 2009 with some gaps between years. Within the Willis Point Fire Protection Service Area, all historic ignitions have been human caused (Figure 7). Ignitions have occurred relatively infrequently within the study area for the length of the historic record, partially due to the small size of the study area. It is also possible that data pre-1951 may underestimate the number of fire starts as it only records fire extent for fires that contributed to an area burned, whereas data after that date includes all fires reported to the Ministry of Forests, Lands and Natural Resource Operation's (MFLNRO) Wildfire Protection Branch.

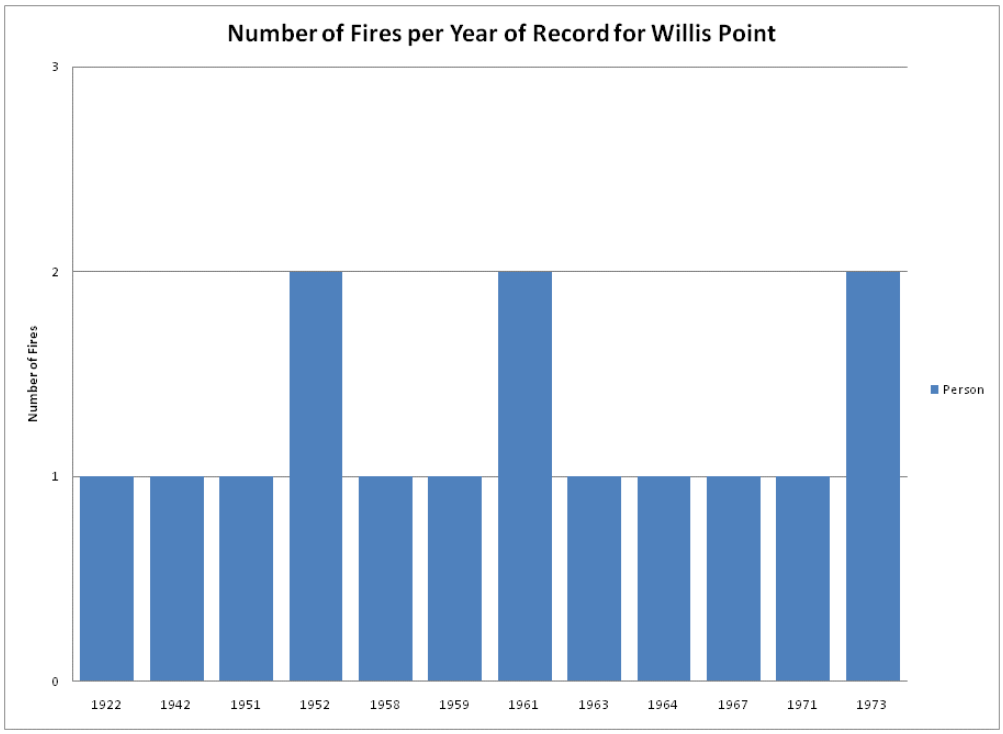


Figure 7. Number of fires per year between 1919 and 2009 within the Willis Point Fire Protection Service Area.

The number of hectares burned per year (Figure 8) shows that there were large areas burned in the 1920s and that area burned has been consistently small since the 1950s, which likely coincides with effective fire suppression.

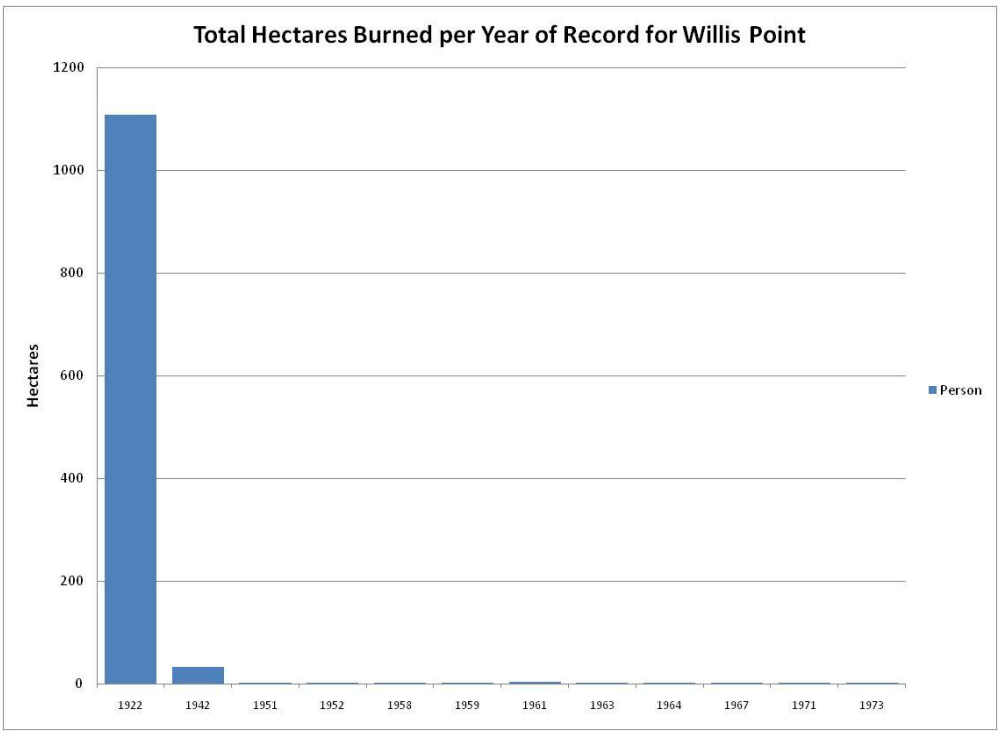
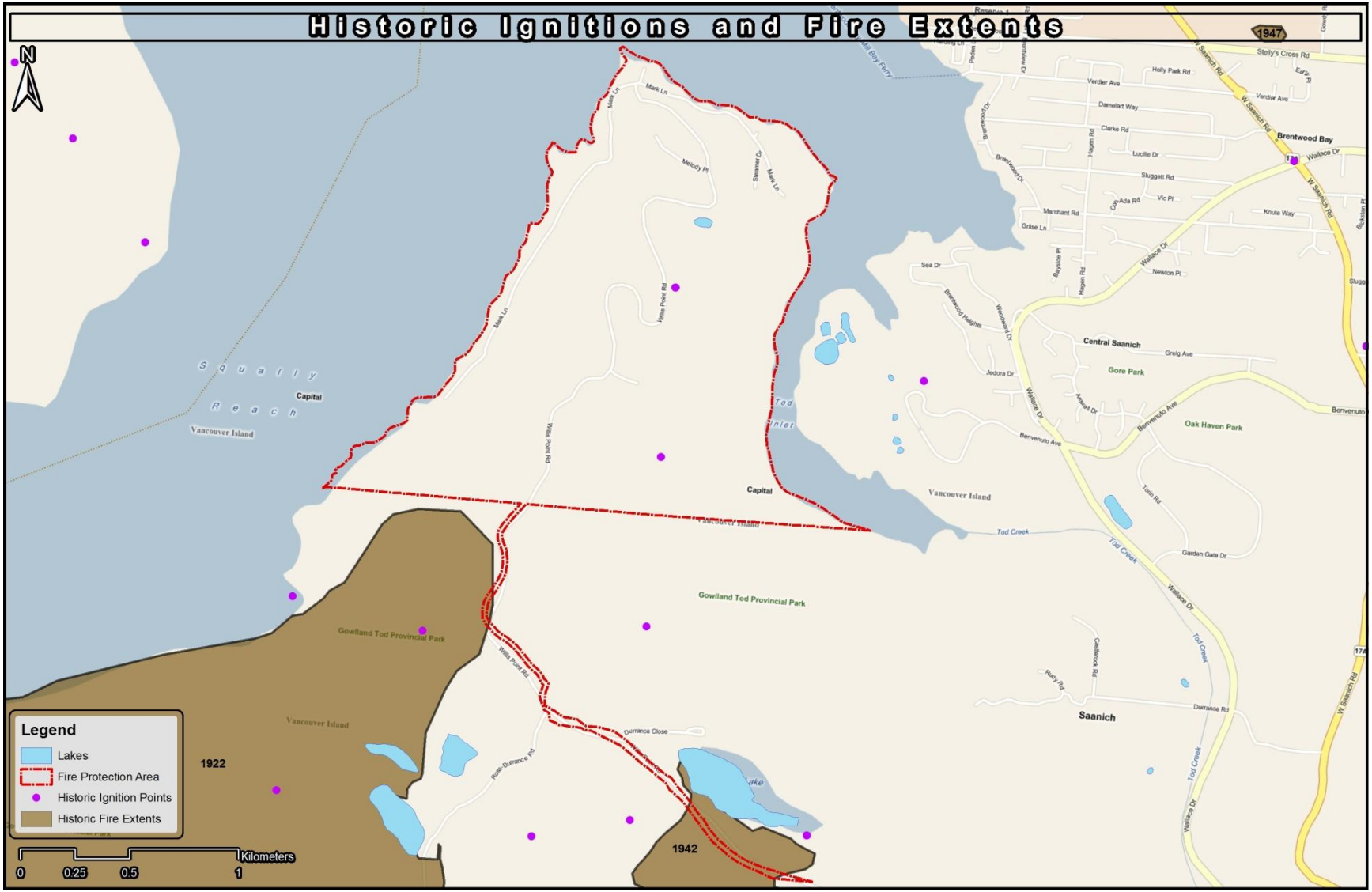


Figure 8. Number of hectares burned per year between 1919 and 2009 within the Willis Point Fire Protection Service Area.

The figures above and the fire history data presented Map 4 indicate that Willis Point and surrounding areas have experienced large fires in the last 100 years. Effective fire suppression since the 1950s has likely reduced the extent of fires within and around the fire protection area.

The point ignition data shown in Map 4 represents ignitions located, as per MFLNRO methodology, on a grid rather than the exact ignition location; therefore, some points are located in water and multiple points are often located on top of one another.



Map 4. Historic ignitions and fire extents from 1919 to 2009.

4.0 The Wildland Urban Interface

The classical definition of wildland urban interface (WUI) is the place where the forest meets the community. Other configurations of the WUI can be described as intermixed. Intermixed areas include smaller, more isolated developments that are embedded within the forest. A graphical example of intermix and interface is shown in Figure 9.

In each of these cases, fire has the ability to spread from the forest into the community or from the community out into the forest. Although these two scenarios are quite different, they are of equal importance when considering interface fire risk. Within the Fire Protection Area, the probability of a fire moving out of the community and into the forest is equal or greater to the probability of fire moving from the forest into the community. Regardless of which scenario occurs, there will be consequences for the community and this will have an impact on the way in which the community plans and prepares for interface fires.

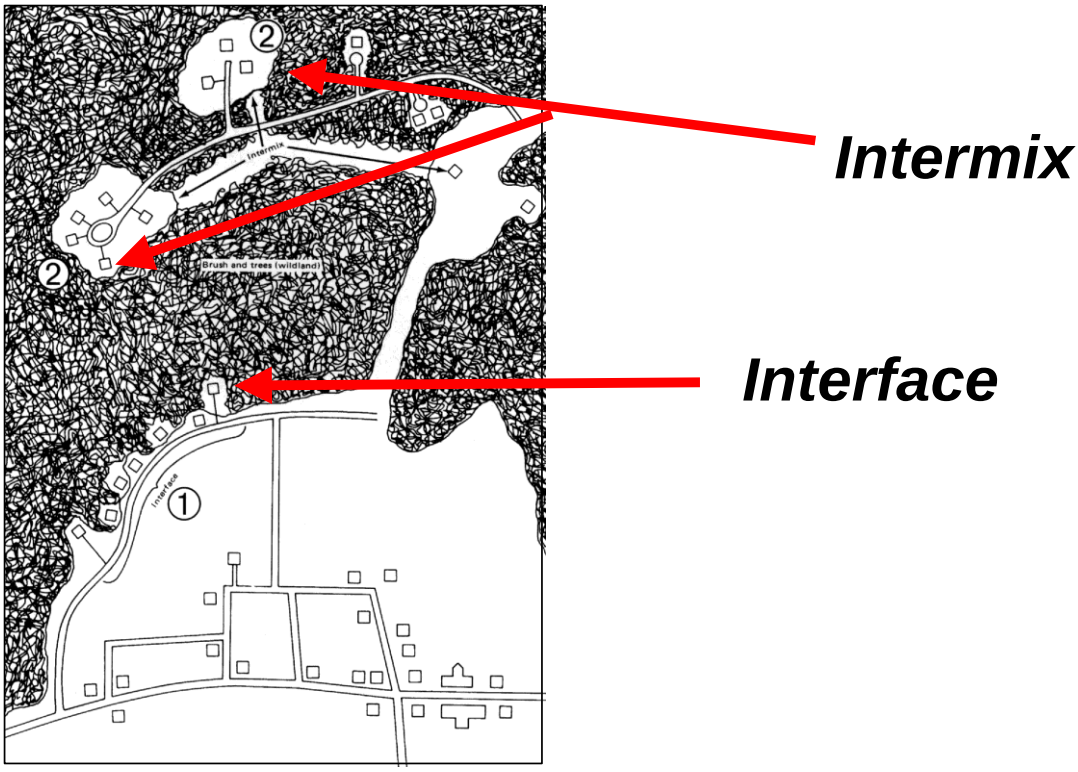
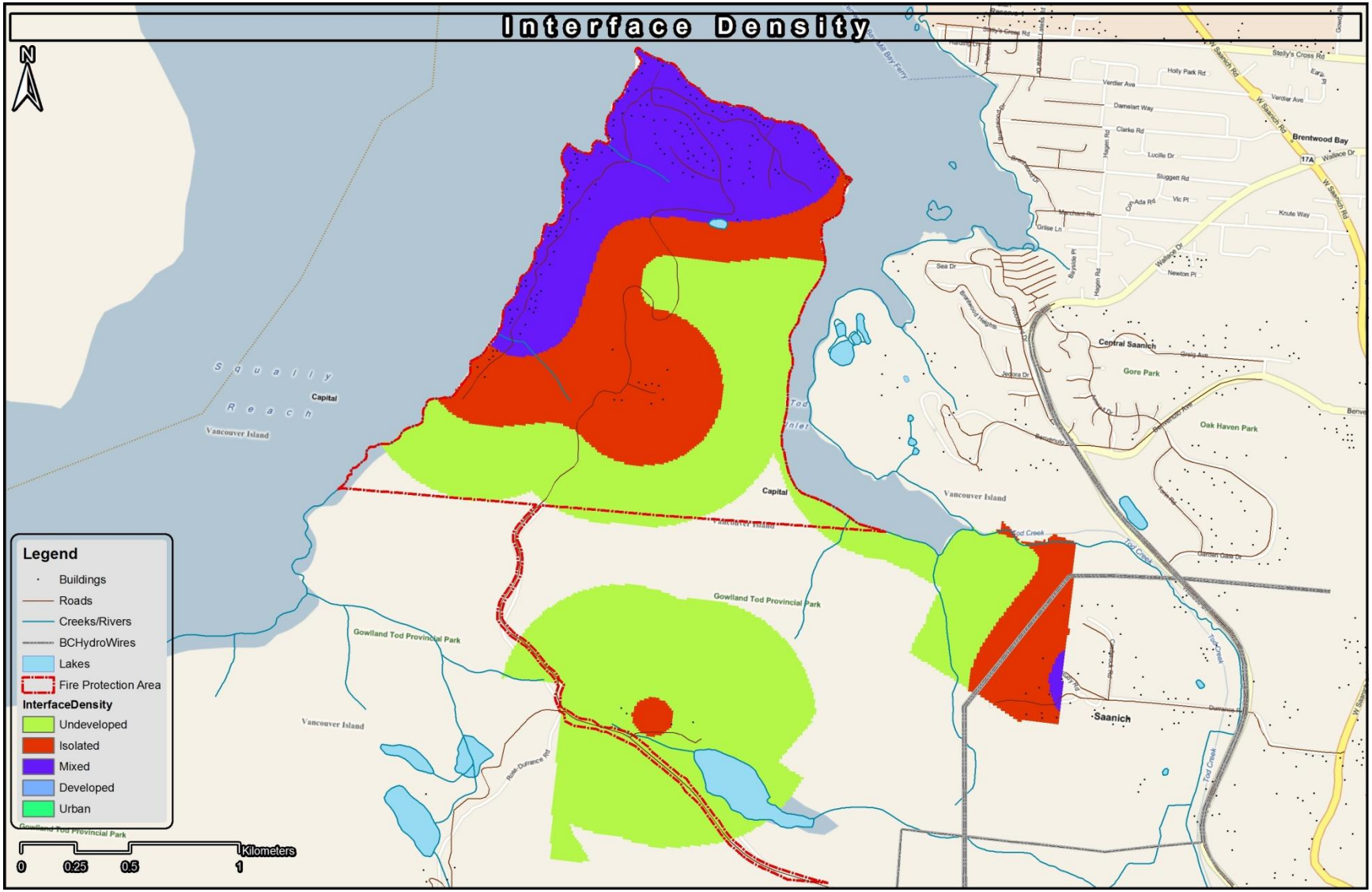


Figure 9. Graphical example showing variation in the definition of interface.

Map 5 shows the interface density classes mapped for the Fire Protection Area. Structures within Willis point falls within the 'Mixed' and 'Isolated' density classes, which look 'intermix' as defined in Figure 9.

Figure 10 shows an image of a garage fire that occurred in Willis Point in 2008. The image shows the fire spreading from the structure into the adjacent forest. The Fire Department was able to control this fire but had this fire occurred in the late summer during a period of high or extreme fire danger, and during high winds, it may have been very difficult to control.

Figure 10. Photos of garage burning in Willis Point during April 2008 (Photo by Art Jackson and posted on the Willis Point website www.willispoint.ca)



Map 5. Interface density classes within the Willis Point Fire Protection Area and surrounding areas.

4.1 Vulnerability of the Wildland Urban Interface to Fire

Fires spreading into the WUI from the forest can impact homes in two distinct ways:

1) From sparks or burning embers getting carried by the wind, or convection that starts new fires beyond the zone of direct ignition (main advancing fire front), and alight on vulnerable construction materials (*i.e.* roofing, siding, decks etc.) (Figure 11).

2) From direct flame contact, convective heating, conductive heating or radiant heating along the edge of a burning fire front (burning forest), or through structure-to-structure contact. Fire can ignite a vulnerable structure when the structure is in close proximity (within 10 meters of the flame) to either the forest edge or a burning house (Figure 12).

Figure 11. Firebrand caused ignitions: burning embers are carried ahead of the fire front and alight on vulnerable building surfaces.

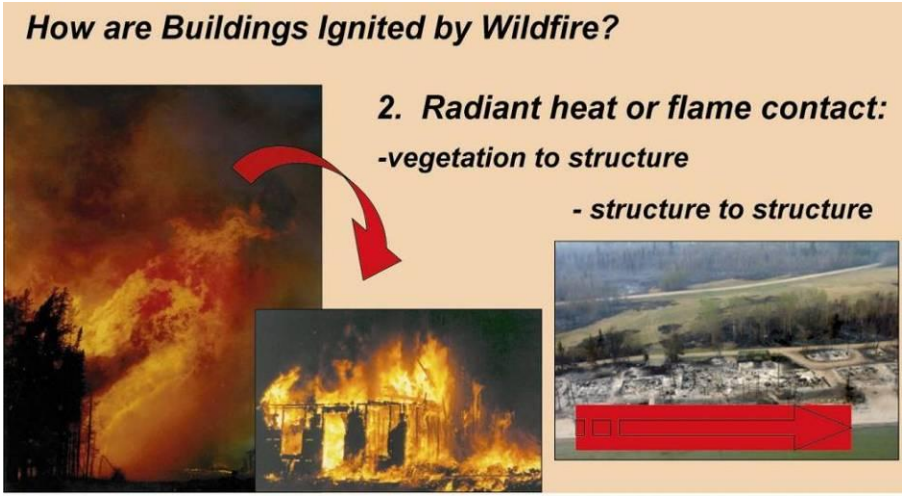


Figure 12. Radiant heat and flame contact allows fire to spread from vegetation to structure or from structure to structure.

5.0 Community Wildfire Protection Planning Process

The WUI continuum summarizes the main options available for addressing WUI fire risk in the CWPP process (Figure 13).

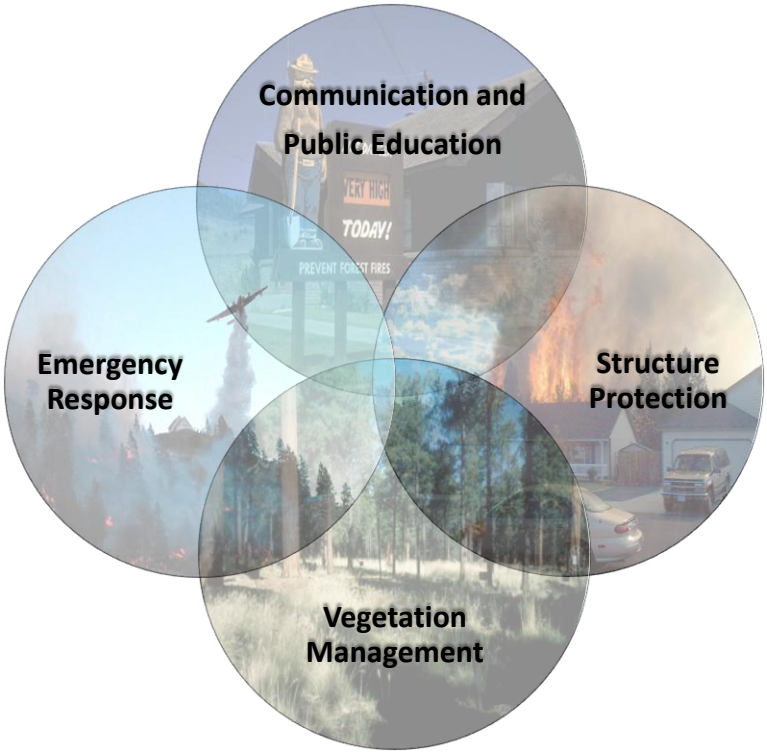


Figure 13. Wildland urban interface continuum summarizing the different options for addressing fire risk during the Community Wildfire Protection Plan process.

The recommended management response to a given wildfire risk profile is based on determining the appropriate combination and level of emphasis of the key elements shown in Figure 13:

- Communication and public education (e.g., signage, websites, advertising, communication planning, private owner structure protection and vegetation management)
- Structure protection (e.g., FireSmart principles for construction and vegetation management, National Fire Protection Association [NFPA] standards, subdivision design)
- Vegetation management (e.g., identifying hazardous fuel types, reducing crown and ladder fuels, landscape level fuel breaks)
- Emergency response (e.g., evacuation and access routes, firefighting capability, training, emergency response planning, post-fire rehabilitation planning)

Determining where effort for wildfire mitigation should be focused is based on an assessment

of risk, defined as the factors that contribute to the probability of fire and the values at risk (consequence) in the community. A variety of management responses are appropriate within a given community based on the Community Risk Profile presented in Section 6.0.

6.0 Community Risk Profile

Two parallel approaches were used to develop the risk profile for each community within the study area.

6.1 Stakeholder Workshop

The first part of the approach involved a workshop with participation from Fire Chiefs, emergency program coordinators and representatives, regional and municipal staff (planning, engineering, parks, water and building) and a representative from the MFLNRO (formerly the Ministry of Forests and Range) Protection Branch . The workshop used a Structured Decision Making approach as defined in Hammond *et al.* (1999)[3]. The decision problem was defined as:

> **In order to adequately improve community protection against a large wildfire event, which mitigation strategies make the most sense for implementation in CRD communities and Sooke?**

Prior to the workshop, key objectives were elicited from participants via an email questionnaire. At the workshops, participants went through a process of weighting those objectives and defining the 'best' alternatives for each community. We then used this information to look at the consequences and tradeoffs of each alternative on the defined objectives. This process enabled us to determine which mitigation strategies had the biggest impact on the objectives that matter to communities. Those objectives that we could not influence through our mitigation alternatives were removed from the analysis because they do not affect our decision.

Across all stakeholders, regardless of community representation, means objectives that supported the fundamental objective of protecting human life and well-being were consistently rated at the top. There was a lot more variability across the group on the fundamental objectives of protecting economic values and protecting environmental values. It is our interpretation that this variation is explained both by the stakeholder's perception of:

1. The impacts of wildfire on these objectives in the context of these specific communities; and,
2. The stakeholder's ability to influence the impact on objectives through their decision.

[3] Hammond, J., Keeney, R. And H. Raffia. 1999. Smart Choices: A Practical Guide to Making Better Decisions. Harvard Business School Press, Boston, Ma, USA.

In other words, the ranking of objectives is not necessarily a reflection of the objective's inherent value or importance, but a reflection of the objective's importance in relation to this specific decision.

Representatives of Willis Point generally agreed with the consistently moderate and high objectives shown in Table 2. However, minimizing the spread of invasive species was rated slightly higher than in most other areas. This may reflect the protected area values that exist within the protection area, and a level of community awareness of the invasive species issue in the local area.

Objectives were assigned measurable metrics and this was used to compare alternatives relative to the status-quo (i.e., current practices) and gauge their impacts on objectives. For Willis Point, a comparison of possible mitigation alternatives against objectives determined that the objectives most benefited by mitigation strategies were:

1. Improved public understanding of fire risk and personal responsibility;
2. Reducing ignitions;
3. Protecting homes/structures;
4. Minimizing fire behaviour;
5. Protecting critical infrastructure;
6. Minimizing invasive species spread; and,
7. Maintaining recreation quality/opportunity.

The order of the objectives in the list above reflects how much the mitigation alternatives defined in the workshop were able to impact our objective (i.e., 1. on the list was the objective most impacted by the mitigation alternative).

Interestingly, though the following objectives were important, our available alternatives did not impact the metrics we used to measure them in relation to the status-quo:

- Suppression response – this was measured in terms of response time, which is currently quite good across the fire protection area and will not be changed by our alternatives.
- Evacuation ease – this was measured in terms of number of homes with 1-way in-out access. There are no opportunities to build secondary road access to the community and water is the only secondary evacuation option from Willis Point, therefore evacuation will be an ongoing management issue for the Fire Protection Area.

The metrics used to measure impacts on objectives were not exhaustive and so were not the sole factor used to determine recommendations for each community. For example, there is more to improving suppression response than just improving response time and so we still consider other elements of suppression response. What this analysis does is provide direction on where we should focus our efforts in wildfire mitigation by highlighting what is most important to consider and where we can likely make the biggest improvements.

Table 2. Fundamental and means objectives considered in the workshop, and colour coded objectives that were ranked consistently across groups. The objectives in unshaded cells were ranked low to moderate but varied between groups.

Fundamental Objectives	Means Objectives #1	Means Objectives #2
Human Life and Social Benefit/Well-Being	**Reduce Wildfire Threat**	**Ignitions**
		Suppression Response
		Fire Behaviour
	Protect Community Infrastructure	**Critical infrastructure**
		Homes /Structures
	Maximize Safety	**Evacuation Ease (Egress)**
	Minimize Health Impacts	Drinking water
		Air quality
	Maintain Recreation Quality/ Opportunity	**Maintain Park/Trail Recreation**
	Enable Effective Implementation	Cost of Implementation (incl. additional res.)
		Maximize Public Understanding of Fire Risk and Personal Responsibility
		Political acceptability
Economic	Commercial Assets	Timber Assets
	Residential Land Value	Visual Quality
Natural Environment	Biodiversity	Minimize Invasive Species Spread
		Minimize Habitat Loss for Fire Vulnerable Species

Consistently High | Consistently Moderate

6.2 Modelling Wildfire Risk

The second approach to developing the community risk profile was to use a geospatial wildfire risk model called the 'Wildfire Risk Management System' (WRMS). Individual polygons are weighted for each subcomponent (Figure 14). Using algorithms, the subcomponents are combined to produce component weightings which are then further processed to derive probability and consequence ratings.

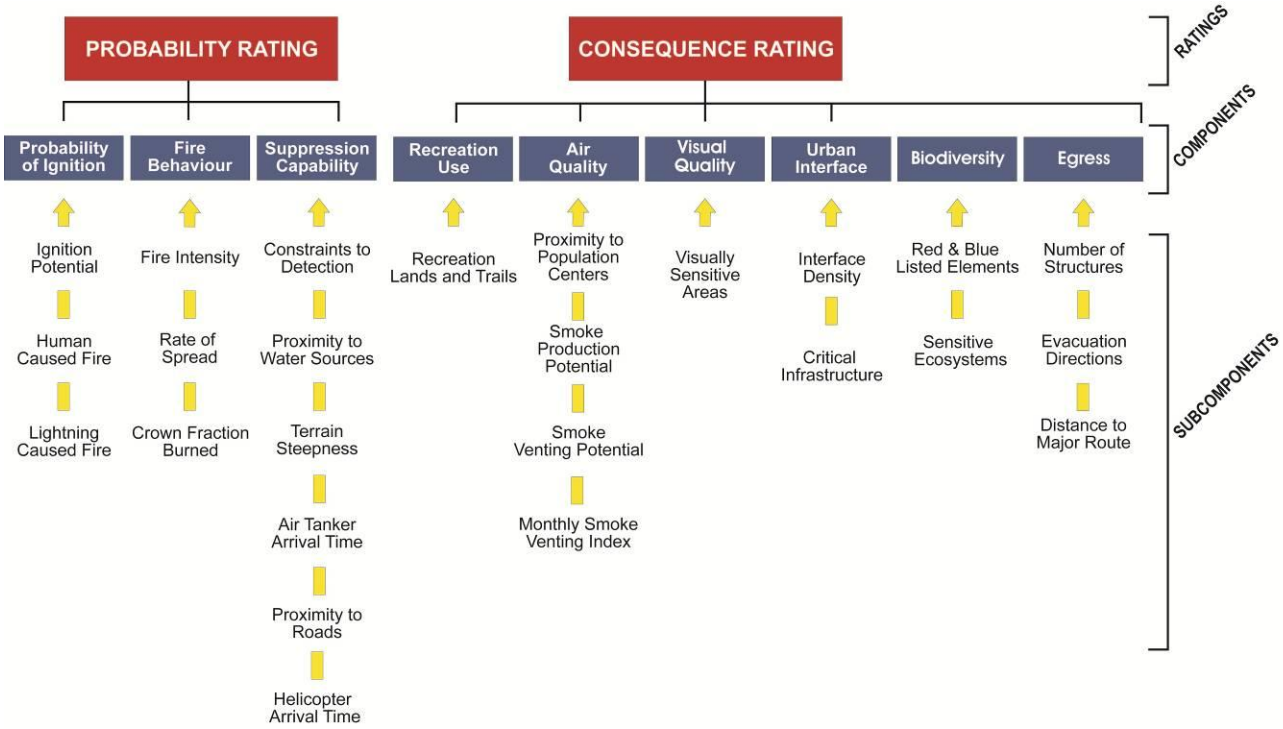


Figure 14. Illustration of the sub-components and components used to calculate the final probability and consequence ratings within the Wildfire Risk Management Structure for the CRD and Sooke.

The weightings used for the CRD and Sooke communities WRMS were determined using the ranking of objectives derived during the stakeholder workshop. Component weightings were as follows:

- Probability Rating
  - Probability of Ignition: 35%
  - Potential Fire Behaviour: 30%
  - Suppression Capability: 35%
- Consequence Rating
  - Urban Interface: 49%
  - Egress (Evacuation Ease): 20%
  - Recreation: 10%
  - Biodiversity: 7%
  - Visual Quality: 7%
  - Air Quality: 7%

6.2.1 The Base Case

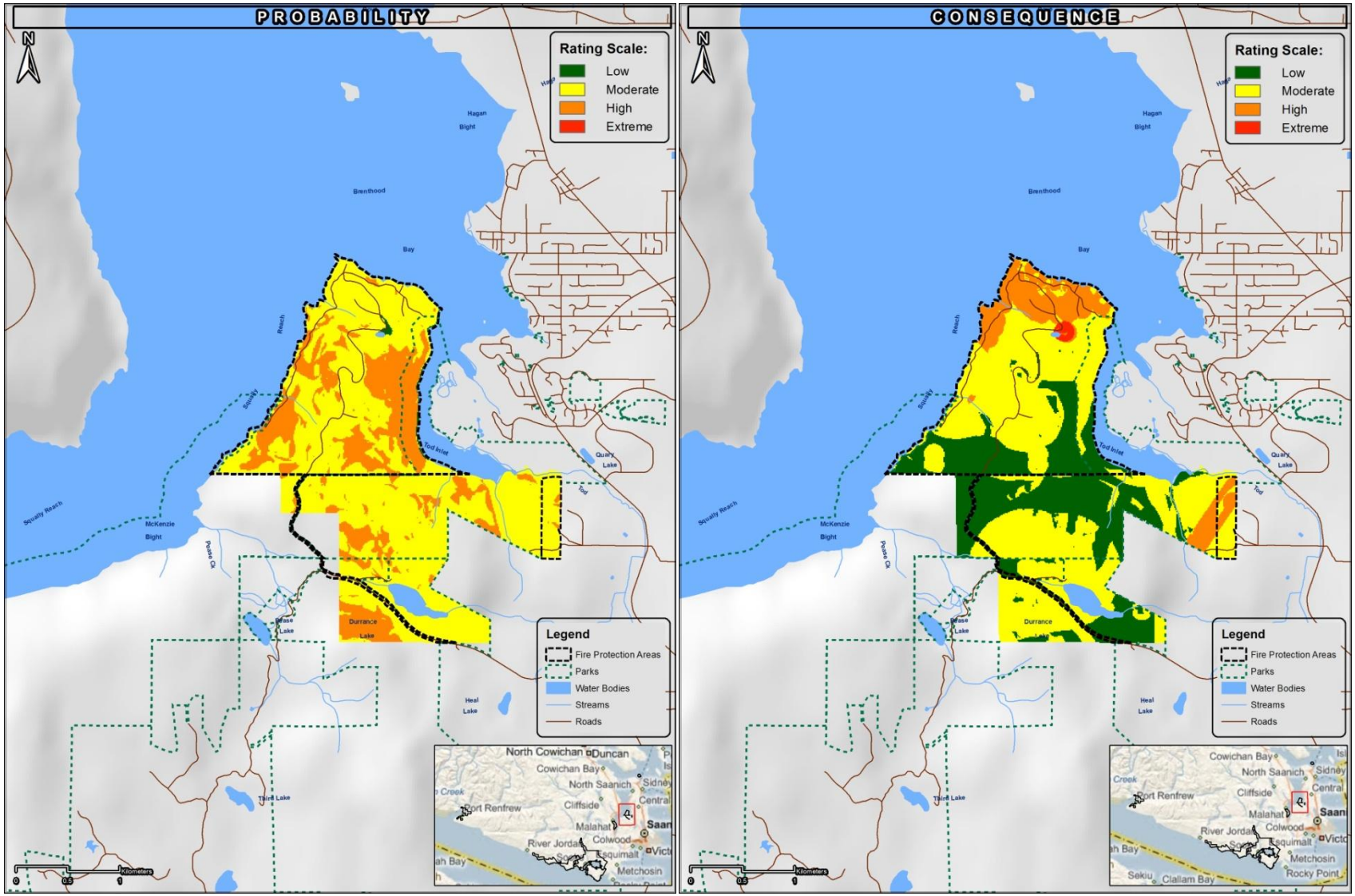
The base case WRMS reflects current conditions for each of the subcomponents, components and ratings shown in Figure 14 according using data available from the Province, the CRD and data collected in the field. All map outputs for the WRMS are provided in Appendix 1.

The probability of fire within Willis Point is predominantly moderate to high based on expected fire behaviour, ignition and suppression capability (Map 6). The consequence of wildfire is predominantly moderate to high with areas of extreme (Map 6) driven primarily by critical infrastructure, interface density and evacuation.

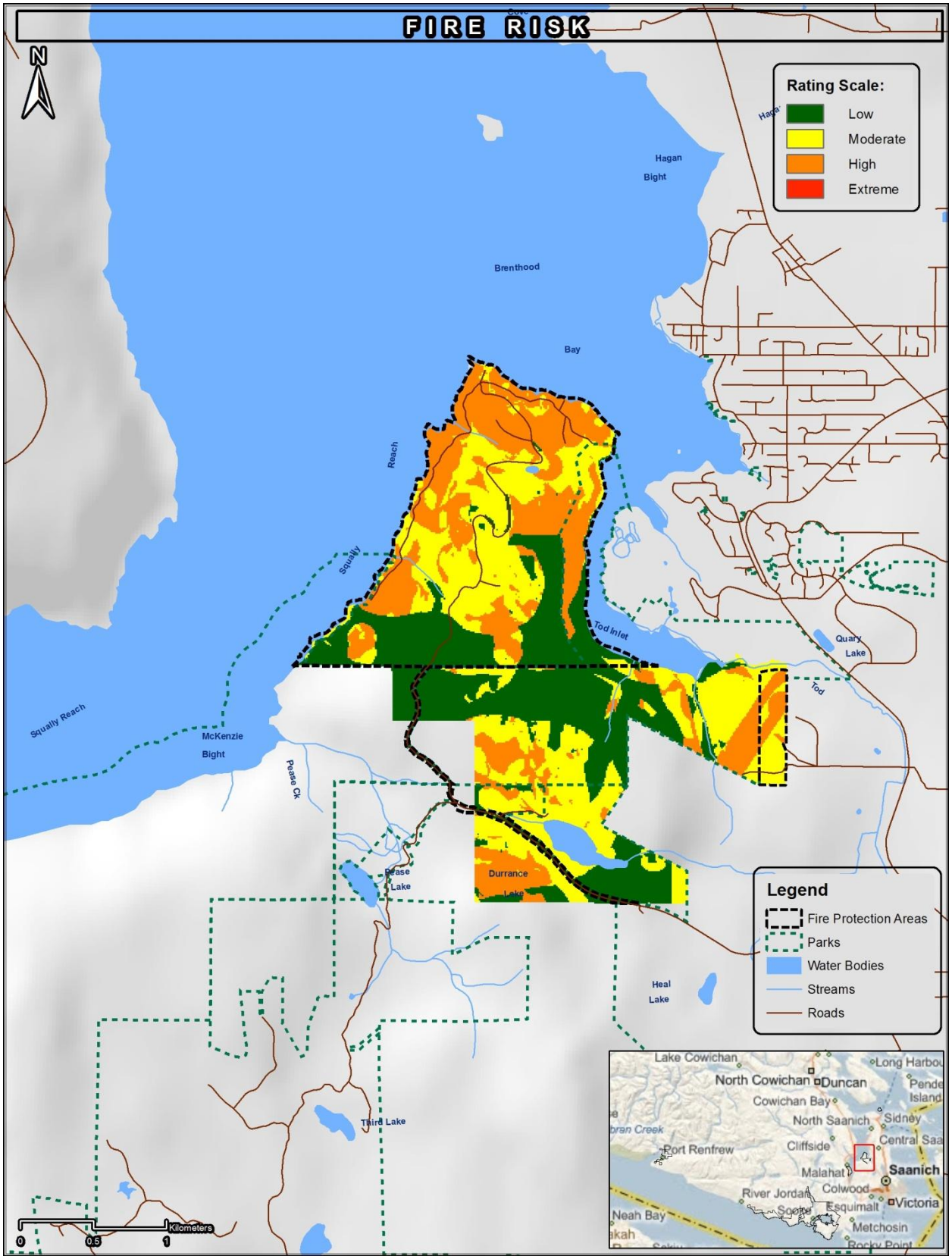
Fire risk (Map 7) represents the overall fire risk as a combination of probability and consequence defined as follows:

Fire Risk Matrix

		PROBABILITY>>>>			
		Low	**Moderate**	**High**	**Extreme**
CONSEQUENCE>>>>	**Low**	Low	Low	Low	Moderate
	Moderate	Low	Moderate	High	High
	High	Moderate	High	High	Extreme
	Extreme	Moderate	High	Extreme	Extreme



Map 6. Probability of wildfire (left) and consequence of wildfire (right) from the Wildfire Risk Management System.



Map 7. Willis Point Fire Risk from the Wildfire Risk Management System.

6.2.2 WRMS Re-Runs

Based on the objectives rated as consistently high from the stakeholder workshop, we identified four hypothetical mitigation scenarios. These were used to re-run the WRMS in order to see their impact spatially on overall wildfire risk. The four scenarios were:

1. Reducing human ignitions by 50% (reducing ignitions objective).
2. Improving suppression capability by adding water sources in locations that were poorly serviced (improving suppression response objective).
3. Modifying fuels in priority areas across the study area (i.e., 100 m around homes, critical infrastructure and several select fuel treatment areas on Crown land adjacent to structures) (reducing fire behavior, protecting critical infrastructure and homes/structures).
4. Improving egress (evacuation ease) by adding 2-way access in specific subdivisions across the study area (evacuation ease objective).

Because alternatives did not impact improving egress, on re-runs 1-3 were modeled. The following maps show the comparison of the relevant component of the WRMS from the base-case to the re-runs described in points 1 - 3 above.

Map 8 shows the comparison from the base case to re-run 1, a 50% reduction in ignition. Though there is a noticeable change in the ignition maps, there is very little change in the probability component overall. This is because of the localized impact of reducing human ignitions based on historic data. The Wildfire Ignition Probability Predictor and lighting ignitions still contribute to a predominantly moderate ignition probability. The limited sensitivity of the model to a change in human ignition supports our professional judgment that reducing human ignitions, while an important objective, is only part of the answer for improving wildfire protection across the landscape. Ignitions across the Fire Protection Area are low annually (less than 5) probably due to enforcement and public education already in place. A further reduction would be beneficial and would further reduce the probability of a wildfire occurring but it is not possible to prevent all ignitions, or fires burning into the Fire Protection Area, and it only takes one ignition under extreme weather conditions and delayed suppression to create a wildfire emergency.

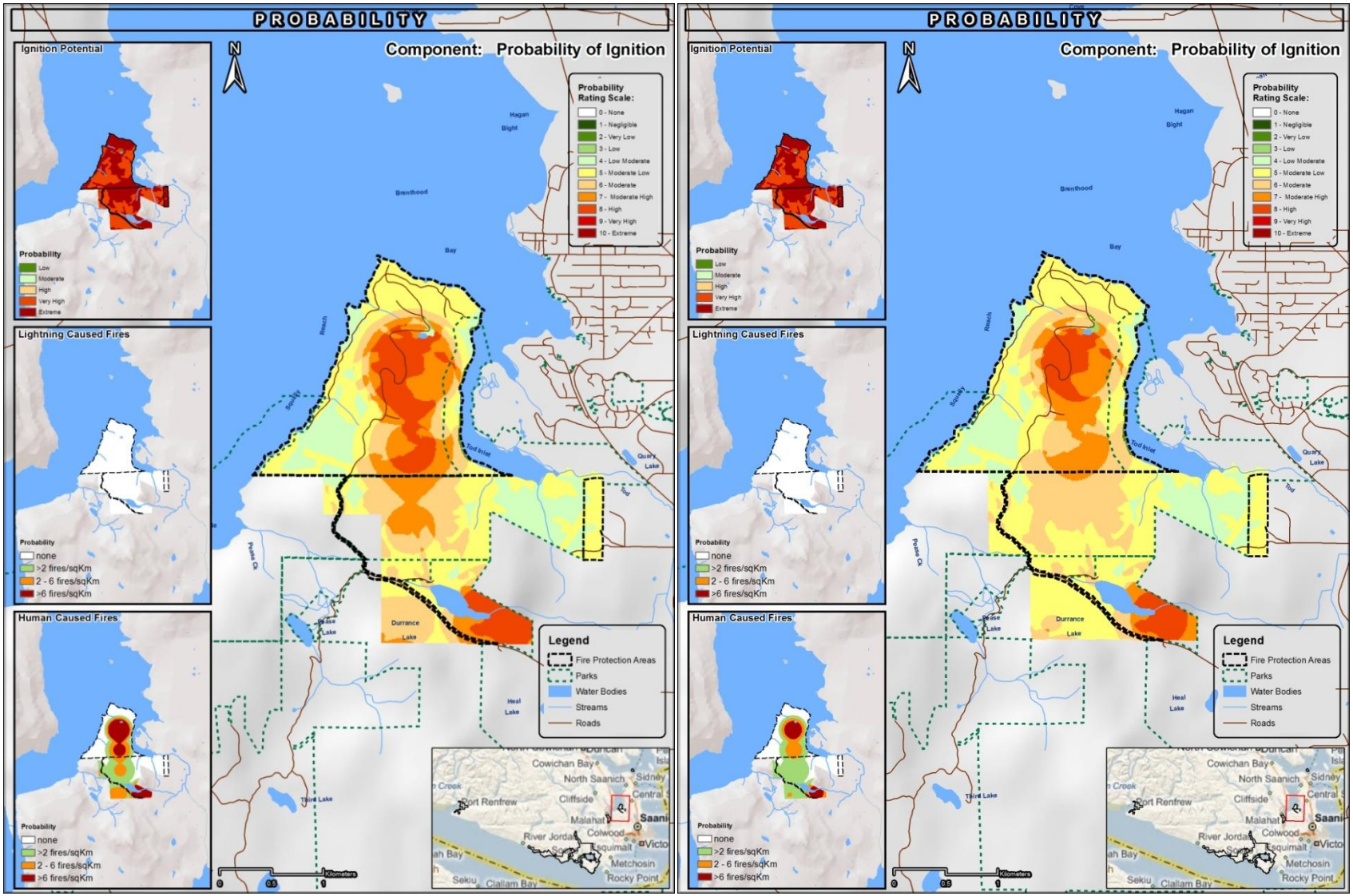
Map 9 shows the comparison from the base case to re-run 2, additional water sources to improve suppression capability. There are localized changes to suppression capability, particularly at Sea Aira Heights Drive, from strategically adding water sources within the Fire Protection Area. However, the overall change is small because Willis Point already has quite good suppression capability in accessible areas.

Map 10 shows the comparison from the base case to re-run 3, FireSmarting around homes and critical infrastructure to reduce fire behaviour. While the differences in fire probability due to fuel treatments are localized around homes, there is a notable reduction in the probability of extreme fire behaviour (from high to moderate) around Mark Lane. There are also other impacts

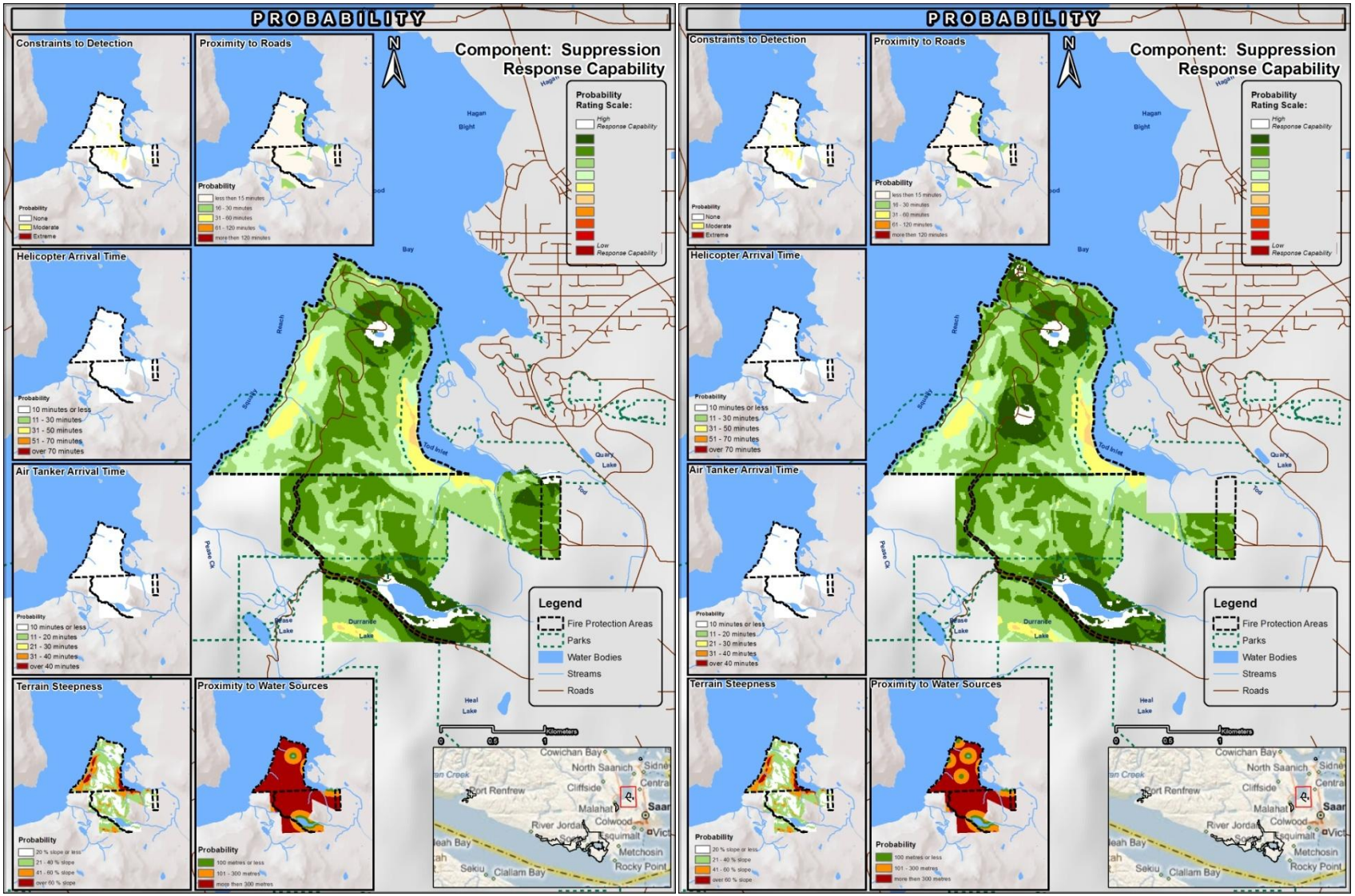
of FireSmarting, including improved protection of homes and critical infrastructure that would provide substantial value not captured in the WRMS model. There may be cases, in very dense, second growth forests, where fuel treatments could also meet broader ecosystem management objectives. However, the focus of fuel modification treatments in this report is on improving structure protection and reducing fire severity in developed areas and along access.

In summary, the mitigation alternatives modeled in the WRMS show that the largest spatial impact is achieved by implementing a mitigation alternative that implements FireSmart treatments around homes and critical infrastructure, and improves access to water for suppression. Localized impacts are seen by reducing human ignitions.

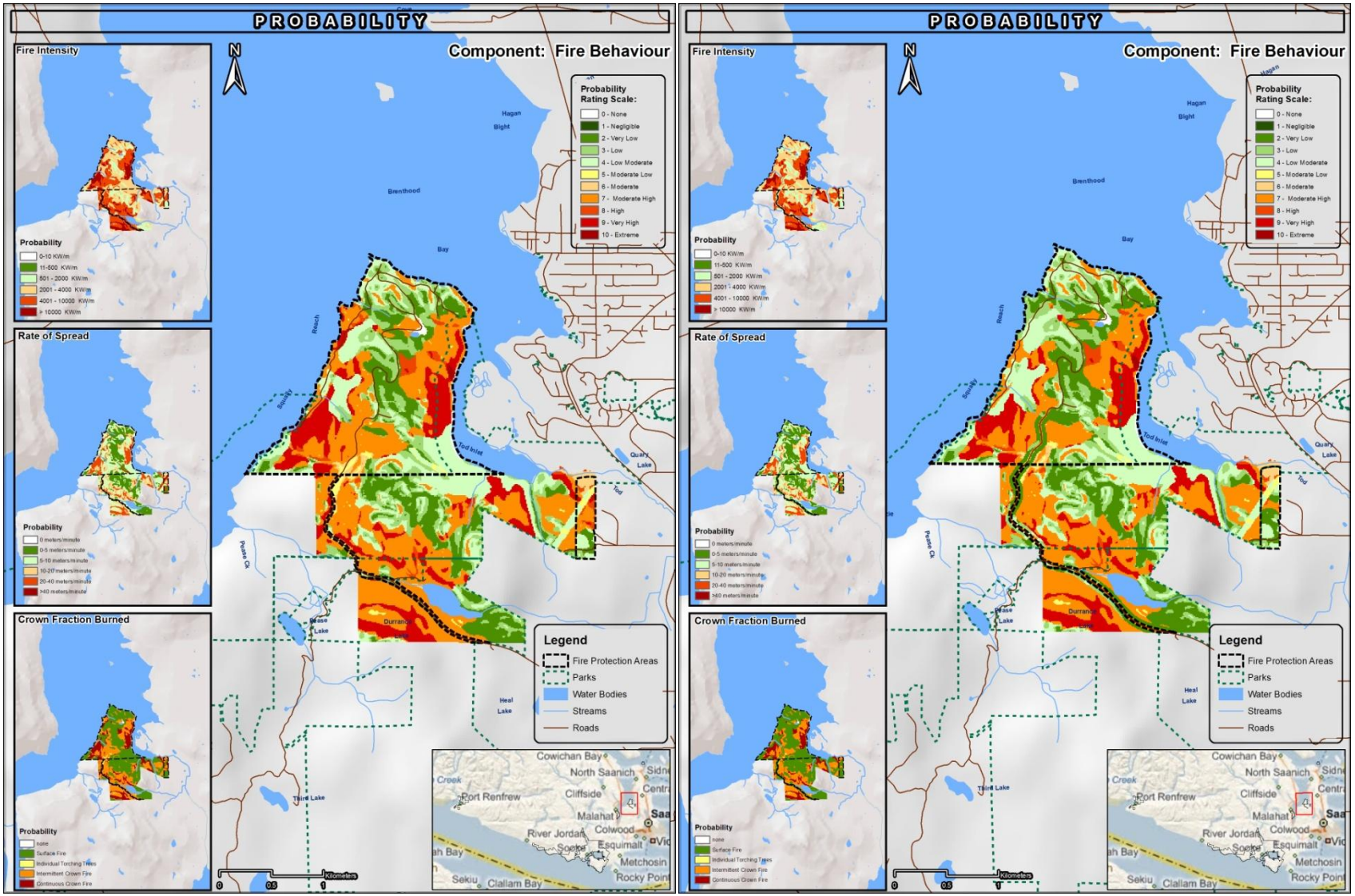
As with the stakeholder workshop analysis, the metrics used to measure changes in these alternatives are not exhaustive and so are not the sole factors we use when determining recommendations for each community. The WRMS does show which of our alternatives has the largest spatial impact. We can use this information to further prioritize objectives and to explicitly identify the locations where changes would be most beneficial.



Map 8. Comparison of probability ignition from WRMS base case (left) to reducing ignitions by 50% (Re-Run 1).



Map 9. Comparison of suppression response capability from WRMS base case (left) to improving water access (Re-Run 2).



Map 10. Comparison of fire behaviour from WRMS base case (left) to FireSmarting around homes and critical infrastructure (Re-Run 3).

7.0 Action Plan

The Action Plan consists of the key elements of the WUI continuum and provides recommendations to address each element. In general, recommendations have relevance to more than one key CWPP element (e.g., education recommendations have relevance to structure protection and vegetation management) but we discuss them here under the most applicable topic.

7.1 Communication and Education

7.1.1 Objectives

The objectives for communication and education are:

- To improve public understanding of fire risk and personal responsibility by making residents aware that their communities are interface communities and by educating them on actions they can take to reduce fire risk on private property.
- To establish a sense of homeowner responsibility for reducing fire hazards.
- To improve protection of homes, critical infrastructure and drinking water.
- To maintain recreation quality/opportunity and to minimize the spread of invasive species.
- To raise the awareness of elected officials to the resources required and the risk that wildfires pose to communities.
- To continue to work diligently to prevent ignitions during periods of high fire danger.
- To educate residents outside Fire Protection Areas about their level of fire protection and, where appropriate, to encourage their participation in Fire Protection Areas.

7.1.2 Current Status

The community of Willis Point has some awareness of fire risk, burn bans and local regulations through educational outreach undertaken by the Fire Department and through the Fire Department website and the 'Pointer' newsletter. Signage at the Fire Department and Willis Point Road is good. The community is FireSmart to varying degrees but many homes are built with fire vulnerable materials, such as unrated roofs and wood siding, and most homes are embedded within flammable vegetation. Individual homeowners could do more to limit the possibility of fire spreading to or from their homes to the forest.

The Juan de Fuca Electoral Area has an emergency program that plans and manages emergency response for the entire Electoral Area. This plan was created in response to the Emergency Program Act. Program activities include the coordination of communication among area response agencies, and direct the Emergency Coordinator.

7.1.3 Recommendations

Recommendation 1: The CRD should consider implementing a multi-media education program that maximizes efforts during the wildfire season, and during and after high profile wildfire events, in order to take advantage of heightened public interest during those periods. In addition to those methods already used, the CRD could:
- Upgrade the Juan de Fuca Electoral Areas website to display or link wildfire prevention information more prominently and to display real time information on fire bans and high fire danger (http://www.bcforestfireinfo.gov.bc.ca/).
- Review and update wildfire preparedness education in primary schools.
- Utilize social media such as Facebook and Twitter to communicate fire bans, high fire danger days, wildfire prevention initiatives and other real time information.
- Provide FireSmart education materials at the point of issuing building permits so that people know the fire hazard where they are building and what they can do to reduce those hazards.
- Use fridge magnet lists to communicate evacuation tips and the essentials needed.

High Priority - Estimated cost: see Recommendation 2.

Recommendation 2: The CRD should consider employing a Fire Prevention Officer to deliver education programs to Electoral Area communities.
High Priority - Estimated cost: $70,000 annual.

Recommendation 3: The CRD should consider providing educational materials to park users and Willis Point residents regarding the threat, including increased fire hazard, posed by the spread of invasive species such as Scotch broom within the park and on private property. Information should include steps residents could take to reduce the presence and spread of invasive species on their own properties.
Moderate Priority – Estimated cost: $1,000.

Recommendation 4: To target visitors and park/trail users, the CRD should consider posting signage with details of how to report ignitions (911) and reckless behaviour (e.g., throwing cigarette butts) both on trails and on roadways to encourage reporting. Trail signage should include location identifiers so that users can identify the location of the report. Signage should be installed within and at the entrances to Gowlland Tod Provincial Park.
High Priority - Estimated cost: $ 1,000 + maintenance.

Recommendation 5: The CRD should consider enhancing existing communications planning for emergency administration, community members and the media. For each Electoral Area community, the plan should identify who is responsible for delivering reliable and timely information during disasters and how this would be achieved if power and telephone communication were unavailable. The plan should also identify contacts for any local, unofficial individuals or groups that would be helpful during an emergency.
High Priority – Estimated cost to be within current operations.

Recommendation 6: The CRD should consider educating property owners who live outside Fire Protection Areas of their status and ensure they are informed of the ways in which they are and are not protected in the event of structural fire and/or wildfire. Where practical, residents should be encouraged to join existing Fire Protection Areas given the protection benefit this provides both to those residents from fighting structural fires and the greater population through preventing wildfire ignitions from structural fires.
High Priority – Estimated cost: see Recommendation 2.

7.2 Structure Protection

7.2.1 Objectives

The objectives for structure protection are:

- To improve public understanding of fire risk and personal responsibility.
- To protect homes/structures and critical infrastructure.
- To improve evacuation ease and emergency access.
- To develop policy tools to adopt FireSmart standards over the next five years and to encourage private homeowners to voluntarily adopt FireSmart on their properties.

7.2.2 Current Status

Homes within Willis Point vary in terms of whether they meet FireSmart standards for construction or vegetation around homes. Some homes do have rated roofs, however many homes are very close to flammable vegetation or are constructed with fire vulnerable roofing and siding (Figure 15). Fire research indicates that roofing, adjacent burnable materials and landscaping play the greatest role in structure ignitability. There is currently no wildfire vulnerability standard for building materials used in the CRD. There are two main avenues for FireSmarting a structure: 1) change the vegetation type, density, and setback from the structure (addressed in Section 7.4); and, 2) change the structure to reduce vulnerability to fire and reduce the potential for fire to spread to or from a structure (addressed here).

Figure 15. Homes constructed with vulnerable roofing and siding, and embedded within vegetation.

The results of fire behaviour modeling under extreme weather conditions indicated that fuel types in and around Willis Point could support fire intensities > 4,000 kw/m^2 and, potentially crown fire throwing burning embers, which we can assume would cause major damage to structures in the absence of successful fire suppression. As more development occurs, having FireSmart bylaws and policy in place could provide substantial benefit from a fire protection perspective. The Fire Chief does review subdivision plans prior to their approval, which is a positive step towards enhancing fire protection within new subdivisions but FireSmart and NFPA standards design could be further supported in Regional bylaw.

7.2.3 Recommendations

Recommendation 7: Consider changes to CRD policy that would improve the FireSmart conditions and suppression access for interface areas. There are several ways in which this can be achieved through different bylaws and guidelines; however it is recommended that NFPA 1142 (Water Supplies for Suburban and Rural Fire Fighting) and 1144 (Protection of Life from Wildfire) standards be used to develop specifications. Current wildfire hazard mapping delineated in OCPs (risk mapping sourced from the province) should be updated based on the protection plan fire risk mapping). An example of how such changes could be incorporated is through the:
- **Official Community Plan**: Statement of support for initiatives, Development Permit Exemptions, Wildfire Hazard Development Permit Area Guidelines (with checklist and requirement for a professional report assessing developments for FireSmart vegetation and access/egress).
- Section 219 Covenants in Wildfire DP Areas.
- Subdivision Servicing Specifications: Fire flows/water delivery system, fire protection water storage systems and access/egress. New subdivisions should be developed with multiple access points that are suitable for evacuation and the movement of emergency response equipment based on threshold densities of houses and vehicles within the subdivisions. Consideration should be given to requiring roadways to be placed adjacent to forested lands, rather than homes (e.g., ring roads).
- Sprinkler Bylaw: Sprinklers.
- Zoning Bylaw: Siting of structures in Wildfire Hazard DP Areas (including critical infrastructure).
- Building Bylaw: Roofing, building materials in Wildfire Hazard DP Areas.
High Priority: Estimated cost to be within current operations.

7.3 Emergency Response

7.3.1 Objectives

The objectives for emergency response are:

- To further develop communication and cooperation between adjacent fire departments, the Regional District and the MFLNRO.
- To build interface firefighting capacity for fire department volunteers.
- To improve evacuation ease and emergency access.
- To maximize community resilience to a wildfire event.

7.3.2 Current Status

Willis Point is a volunteer fire department with approximately 23 volunteers. The fire department has had some interface fire fighting experience but has not worked with the MFLNRO protection branch incident command structure. All members have S100, some have S215 and incident command training. The department has basic interface firefighting equipment, a Compressed Air Foam System truck and a mutual aid agreement is in place with the Highlands Fire Department.

Willis Point residents all use well water and there are no hydrants in the community. The fire department has a 20,000 gallon tank at the fire hall and there are two 5,000 gallon tanks elsewhere in the community.

Access and evacuation is considered difficult for Willis Point. Homes are scattered throughout the forest along a long, 1-way in and out road that runs through Gowlland Tod Provincial Park. The roads are narrow and steep with inadequate turnaround widths for the Fire Department's truck (Figure 16). The main access road in is relatively narrow and winding, and smoke from a wildfire would make the road difficult to navigate safely. The road could also be cut off by fire. Water evacuation with assistance from the coastguard and Brentwood Bay-Mill Bay ferry may a secondary evacuation option.

Figure 16. Turnaround at the eastern end of Mark Ln (left) and turnaround and the western end of Mark Ln (right).

Cell communication is relatively good given that there is a tower located on Willis Point. The wood pole telephone lines are vulnerable to fire. The communications tower is also vulnerable to fire; however, Willis Point should be evacuated well before fire threatens this tower given that it is located adjacent to the fire hall. Hydro distribution lines are also on vulnerable wood poles. The Fire Department has a backup power system that would run their 911 and CREST radio systems in the event of a power failure.

7.3.3 Recommendations

Recommendation 8: The Willis Point Fire Department, supported by the CRD, should consider adding water sources within the community. A dry hydrant at Durrance Lake and storage tanks are likely the most practical options. The enforcement of parking restrictions at Durrance Lake may be required to ensure reliable access to the water source. Homeowners could be encouraged to install water storage tanks for fire protection where practical.
High Priority: Dry hydrant $2,000 plus.

Recommendation 9: The Willis Point Fire Department should consider ensuring that it holds keys to access all gated roadways within the Fire Protection Area.
High Priority: Estimated costs to be within current operations.

Recommendation 10: The CRD and Willis Point Fire Department should consider working with BC Ferries to investigate feasible docking options and a more formal agreement for water-based evacuation assistance using the Brentwood Bay-Mill Bay ferry. If BC Ferries cannot provide that assistance, then alternatives should be investigated.
High Priority: Estimated costs to be within current operations unless new dock required.

Recommendation 11: The CRD should consider improving access along Mark Lane so that it is safe for fire department vehicles to turn around at each end of the lane. This may require the enforcement of restricted parking at the Gowlland Tod access points.
High Priority: Estimated costs $16,000 plus.

Recommendation 12: The CRD should consider developing an Evacuation Plan for Willis Point that identifies:
- Evacuation routes to be marked.
- Safe zones.
- Responsibilities and resources for coordinating and policing evacuation.
- Evacuation process for CRD Parks.
- Options for water-based evacuation.
- Individuals requiring assistance.
- The location of any large pets or livestock requiring evacuation and where they can be evacuated to.
- Potential locations of evacuation centres in adjacent communities, and where and how services would be provided to evacuees.
- Volunteers or volunteer organizations that can assist during and/or after evacuation.

Moderate Priority: Estimated costs to be within current operations.

Recommendation 13: The CRD should consider establishing an integrated 'Wildfire Suppression Group', consisting of representatives from each Juan de Fuca community Volunteer Fire Department, the Sooke Fire Department, mutual aid municipal departments, Wildfire Protection Branch, CRD Water and CRD Parks Suppression Crews to meet annually to establish the compatibility of equipment, identify opportunities for sharing resources, establishing equipment caches to fill gaps, and to plan joint training exercises.
High Priority: Estimated cost to be within current operations.

Recommendation 14: The CRD should develop annual or biannual communications system training program for volunteer fire departments to ensure that members know how to properly use the radio system during a major emergency situation.
High Priority: Estimated cost to be within current operations.

Recommendation 15: The CRD should consider establishing a sub-regional mobile cache of wildland firefighting equipment for Juan de Fuca communities. This would reduce the cost of purchasing and maintaining additional interface equipment for each Fire Department. Personal Protective Equipment and basic tools for interface fire fighting should still be maintained within each Fire Department.
Moderate Priority: Estimated cost $10,000 - $15,000.

7.4 Vegetation (Fuel) Management

Vegetation or fuel management is generally considered a key element of the FireSmart approach. Fuel management is the planned manipulation and/or reduction of living and dead forest fuels for land management objectives (*e.g.,* hazard reduction). The purpose of altering vegetation for fire protection must be evaluated against the other key CWPP elements outlined above to determine its necessity.

Within Willis Point, the outcomes of the stakeholder workshop and the WRMS modelling indicate that modifying fire behaviour through vegetation management could be worthwhile where it contributes to home and critical infrastructure protection.

Fuel management can be undertaken with a very minimal negative or even positive impact on the aesthetic or ecological quality of the surrounding forest and does not mean removing most of the trees. The focus for fuel management in the interface is not necessarily to stop fire, but to ensure that fire severity is low enough that the fire's damage is limited. For example, treating around your home may prevent structure ignition due to direct flame contact – then the home's ability to survive the fire would come down to whether construction materials can survive ember attack. Reducing surface and ladder fuels in the forest around your home may mean that some of the larger, more fire-resistant trees can survive the fire. The intent of these fuel modification treatments is not to stop the fire, but to reduce fire severity.

7.4.1 Objectives

The vegetation management objectives are:

- To proactively reduce potential fire behaviour thereby minimizing adverse impacts on structures.
- To improve protection of homes, critical infrastructure and drinking water.
- To FireSmart vegetation within 100 m of homes and structures.

7.4.2 Current Status

Willis Point fuels predominantly consist of C3, C5 and C7 (

Table 1 and Map 2). A FireSmart approach to vegetation management within 100 m of structures is considered beneficial in order to improve defensible space around structures, and to reduce the likelihood that a house fire could spread to adjacent forest or homes. In addition, fuel treatments adjacent to Willis Point Road are suggested in order to improve road safety and reduce fire severity adjacent to the roadway. The extent of C3 mapped within Willis Point suggests that treatments would involve removing substantial biomass in order to implement FireSmart vegetation management.

Coniferous (and mixed) forest fuels within 100 m of structures were identified throughout Willis Point and prioritized for FireSmart fuel treatment. The majority of area identified is on private land. All coniferous and mixed fuels were identified and prioritized regardless of current hazard condition because fuel conditions change over time and FireSmart requires ongoing maintenance.

Map 11 defines priority treatments. Treatment priority was defined on a regional basis and so Willis Point does not have treatments in all priority classes. Each treatment is either a 'C' for Crown, or 'P' for private and priority is defined as follows:

C1: Priority 1 treatments on Crown land to FireSmart around critical infrastructure.

C2: Priority 2 treatments on Crown land to implement fuel breaks in continuous forestland adjacent to structures.

C3: Priority 3 treatments on Crown land to enhance FireSmart treatments adjacent to private land.

P1: Priority 1 treatments on private land to FireSmart around critical infrastructure.

P2: Priority 2 treatments on private land to FireSmart around private structures.

FireSmart proposes the following zones for vegetation modification (Figure 17):

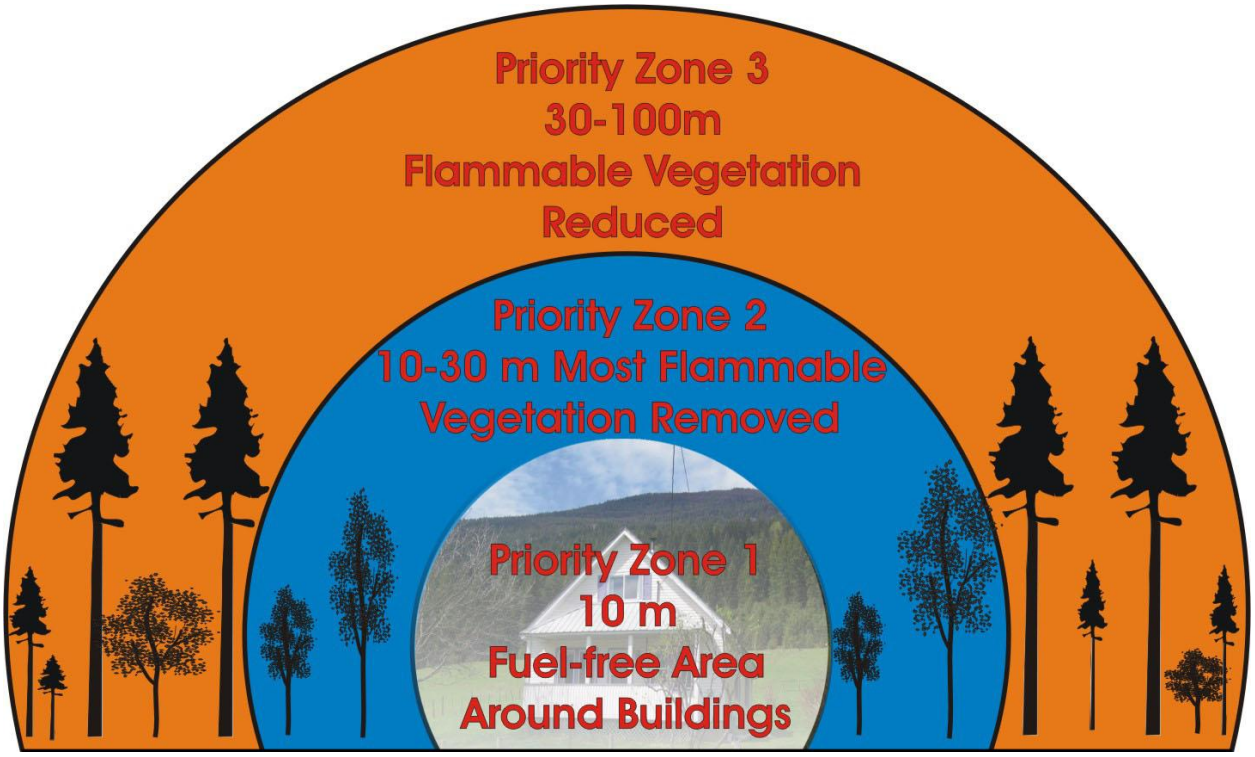
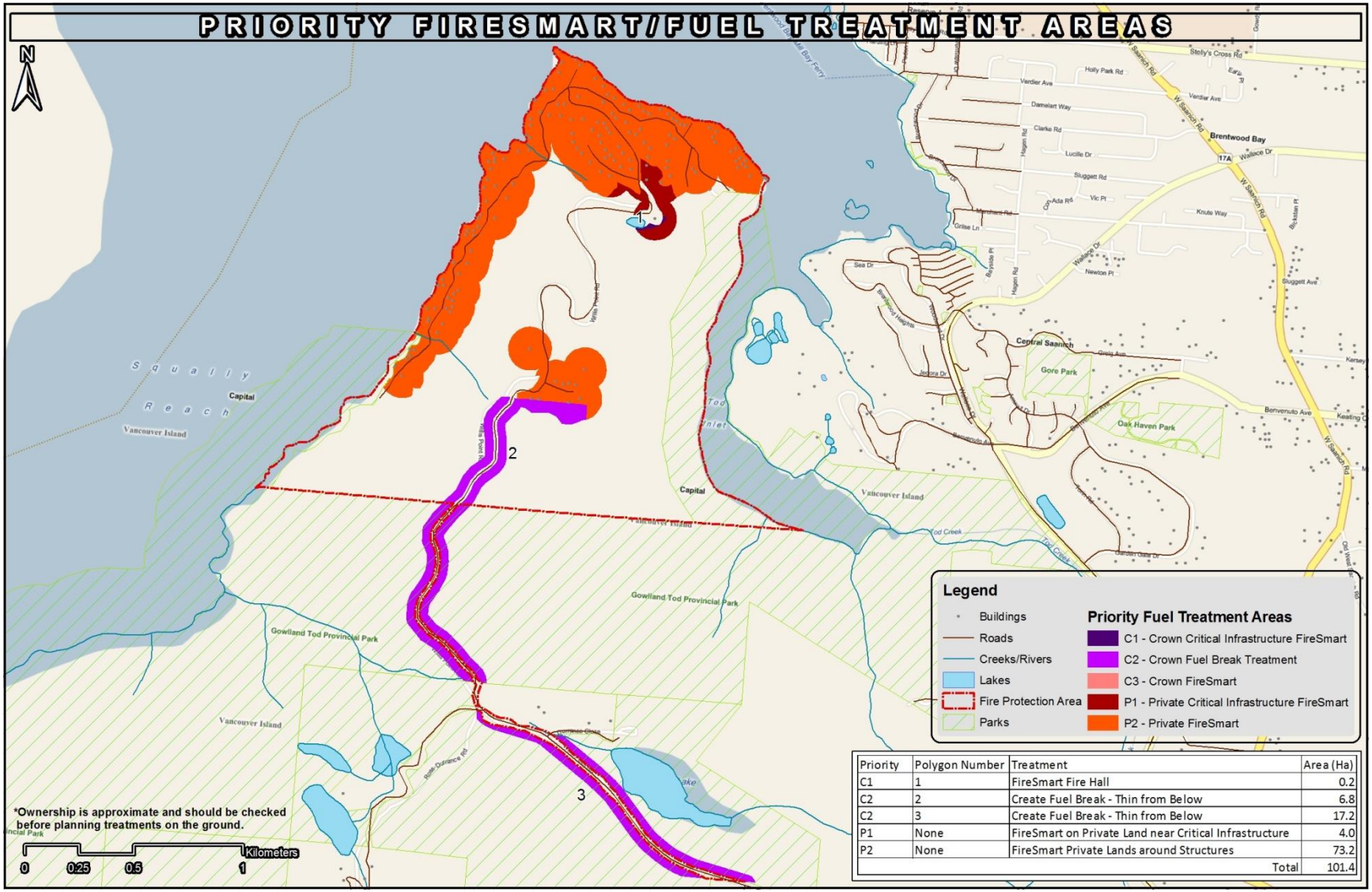


Figure 17. FireSmart Priority Zones

1. **Priority Zone 1** is a 10 m fuel free zone around structures. This ensures that direct flame contact with the building cannot occur and reduces the potential for radiant heat to ignite the building. While creating this zone is not always possible, landscaping choices should reflect the use of less flammable vegetation such as deciduous bushes, herbs and other species with low flammability. Coniferous vegetation such as juniper or cedar bushes and hedges should be avoided, as these are highly flammable. Try to keep any vegetation in this zone widely spaced and well setback from the house.

2. **Priority Zone 2** extends from 10-30 m from the structure. In this zone, trees should be widely spaced 5-10 m apart, depending on size and species. Tree crowns should not touch or overlap. Deciduous trees have much lower volatility than coniferous trees, so where possible deciduous trees should be preferred for retention or planting. Trees in this area should be pruned as high as possible especially where long limbs extend towards buildings. This helps prevent a fire on the ground from moving up into the crown of the tree or spreading to a structure. Any downed wood or other flammable material should also be cleaned up in this zone to reduce fire moving along the ground.

3. **Priority Zone 3** extends from 30-100 meters from the home. The main threat posed by trees in this zone is spotting, the transmission of fire through embers carried aloft and deposited on the building or adjacent flammable vegetation. To reduce the threat, cleanup of surface fuels as well as pruning and spacing of trees should be completed in this zone.



Priority	Polygon Number	Treatment	Area (Ha)
C1	1	FireSmart Fire Hall	0.2
C2	2	Create Fuel Break - Thin from Below	6.8
C2	3	Create Fuel Break - Thin from Below	17.2
P1	None	FireSmart on Private Land near Critical Infrastructure	4.0
P2	None	FireSmart Private Lands around Structures	73.2
		Total	101.4

Map 11. Prioritized fuel treatment areas for Willis Point.

7.4.3 Recommendations

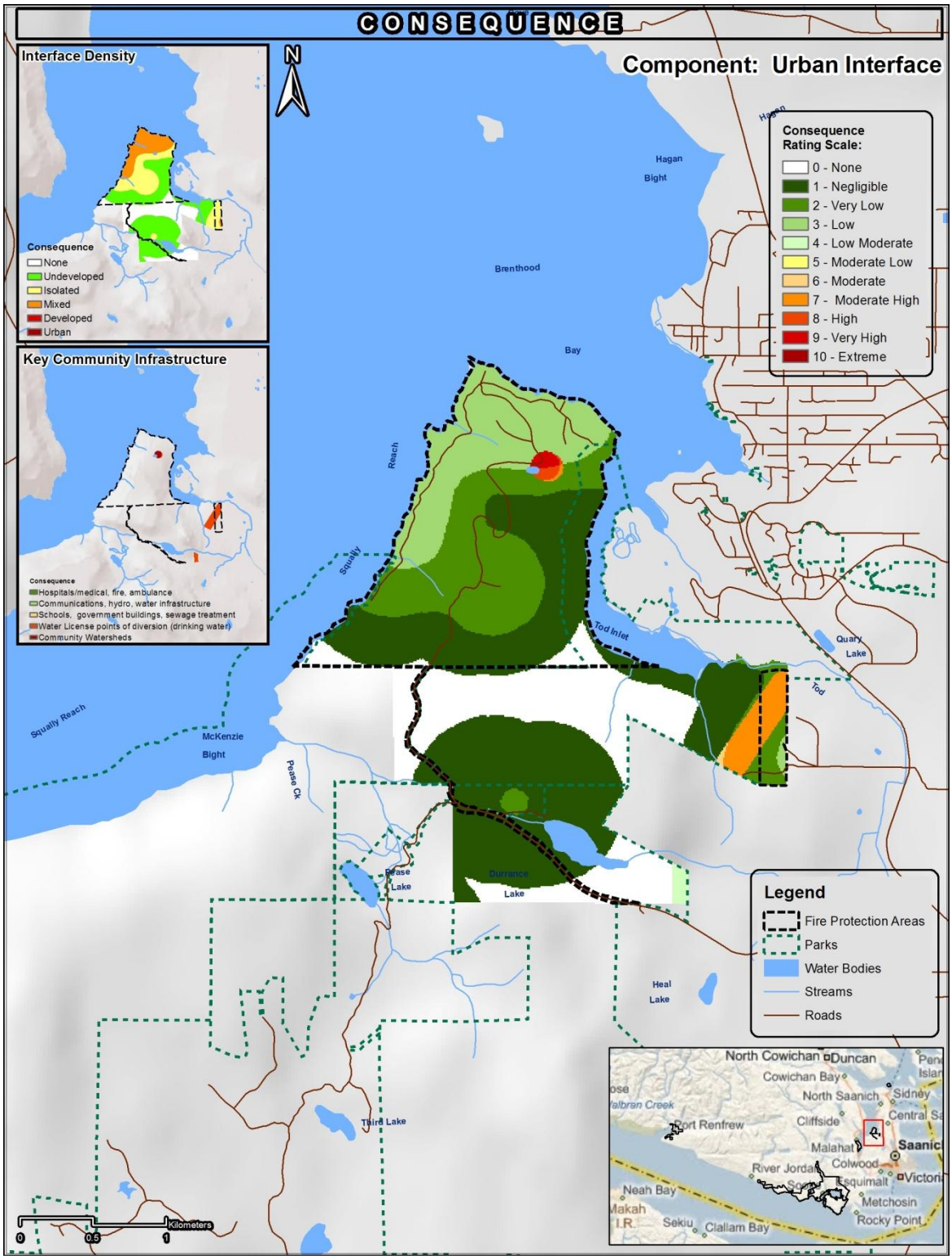
Recommendation 16: The CRD should consider implementing FireSmart treatments in polygons identified as Priority C1 on Map 11. These treatments are around the fire hall. Treatments should be repeated every 10 – 15 years unless forests are converted to a deciduous type. Ideally, the adjacent private land would also be treated for greater protection. The CRD should also review critical infrastructure spatial data to determine if any was missed in this analysis and, if so, include them as a treatment priority.
High Priority: Estimated cost $2,000 /ha - $12,000/ha.

Recommendation 17: The CRD should consider implementing fuel treatments in areas identified as Priority C2 on Map 11. These treatments should be repeated every 10 – 15 years unless forests are converted to a deciduous type.
Moderate Priority: Estimated cost $12,000 - $20,000/ha.

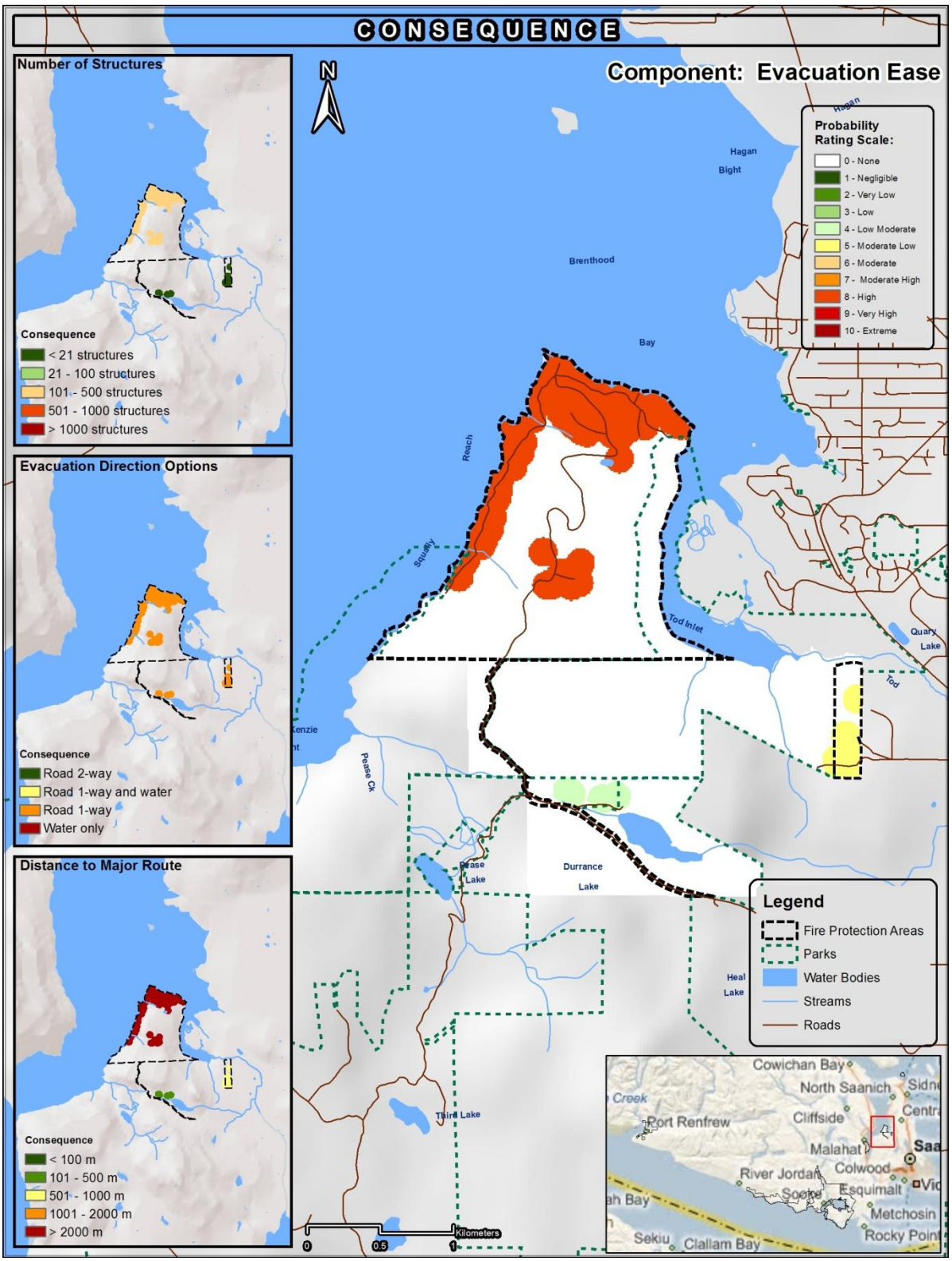
Recommendation 18: The CRD should consider encouraging residents, through education initiatives outlined in Recommendation 1, to implement FireSmart treatments identified as Priority P1 and P2. Particular focus should be given to FireSmart treatments around critical infrastructure.
High Priority: Costs borne by private parties.

Appendix 1 – Wildfire Risk Management System Outputs

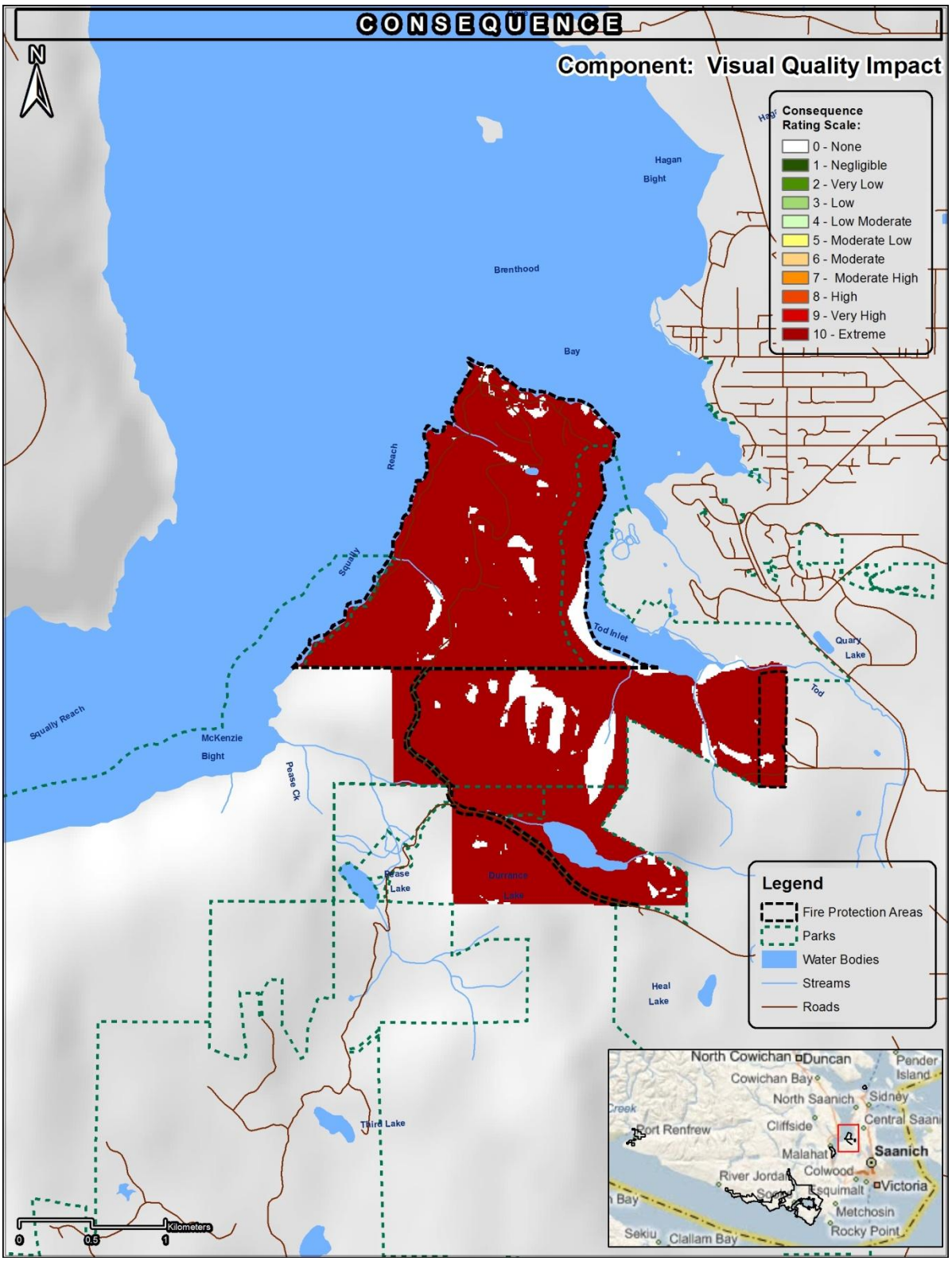
Urban Interface (Consequence)



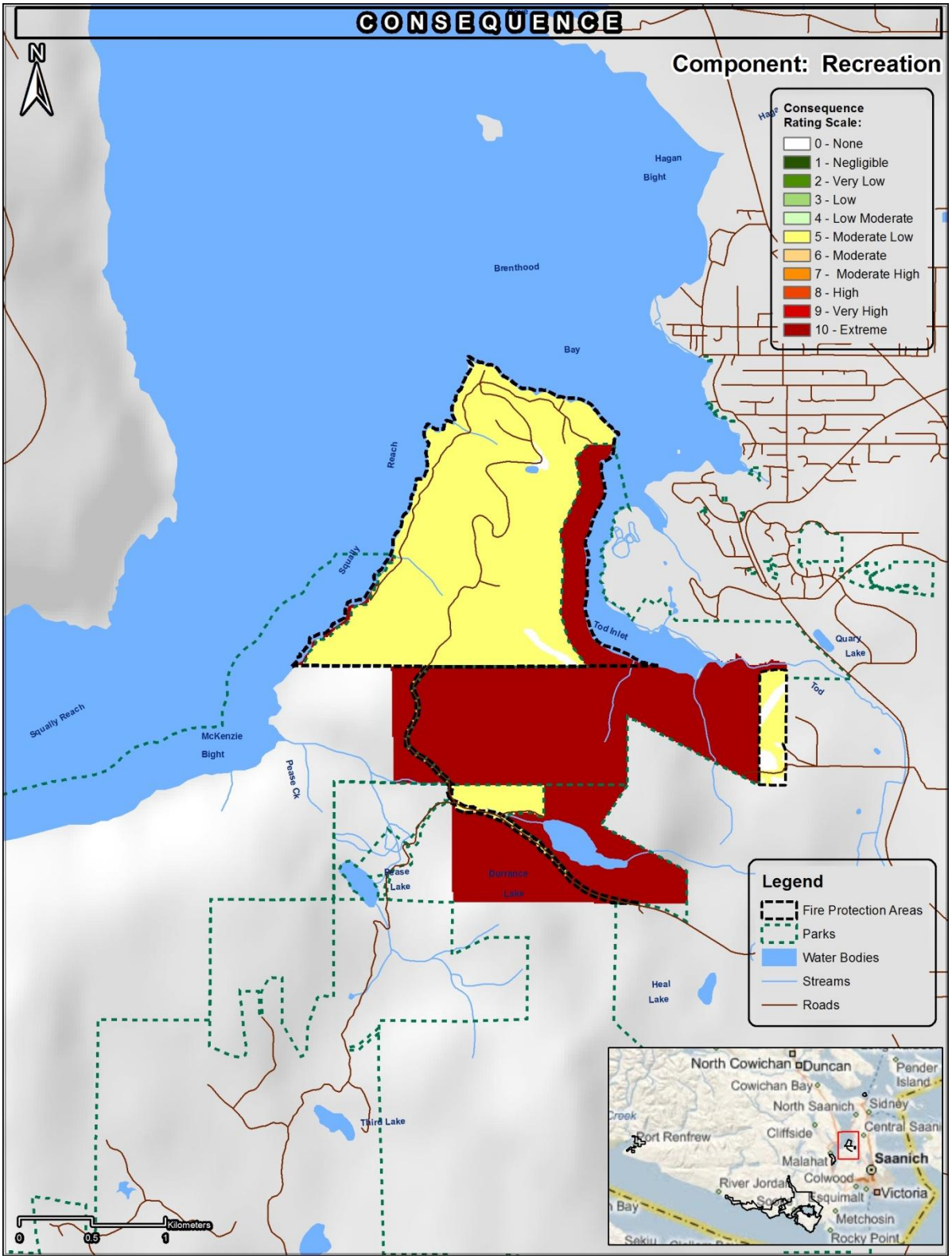
Evacuation Ease (Consequence)



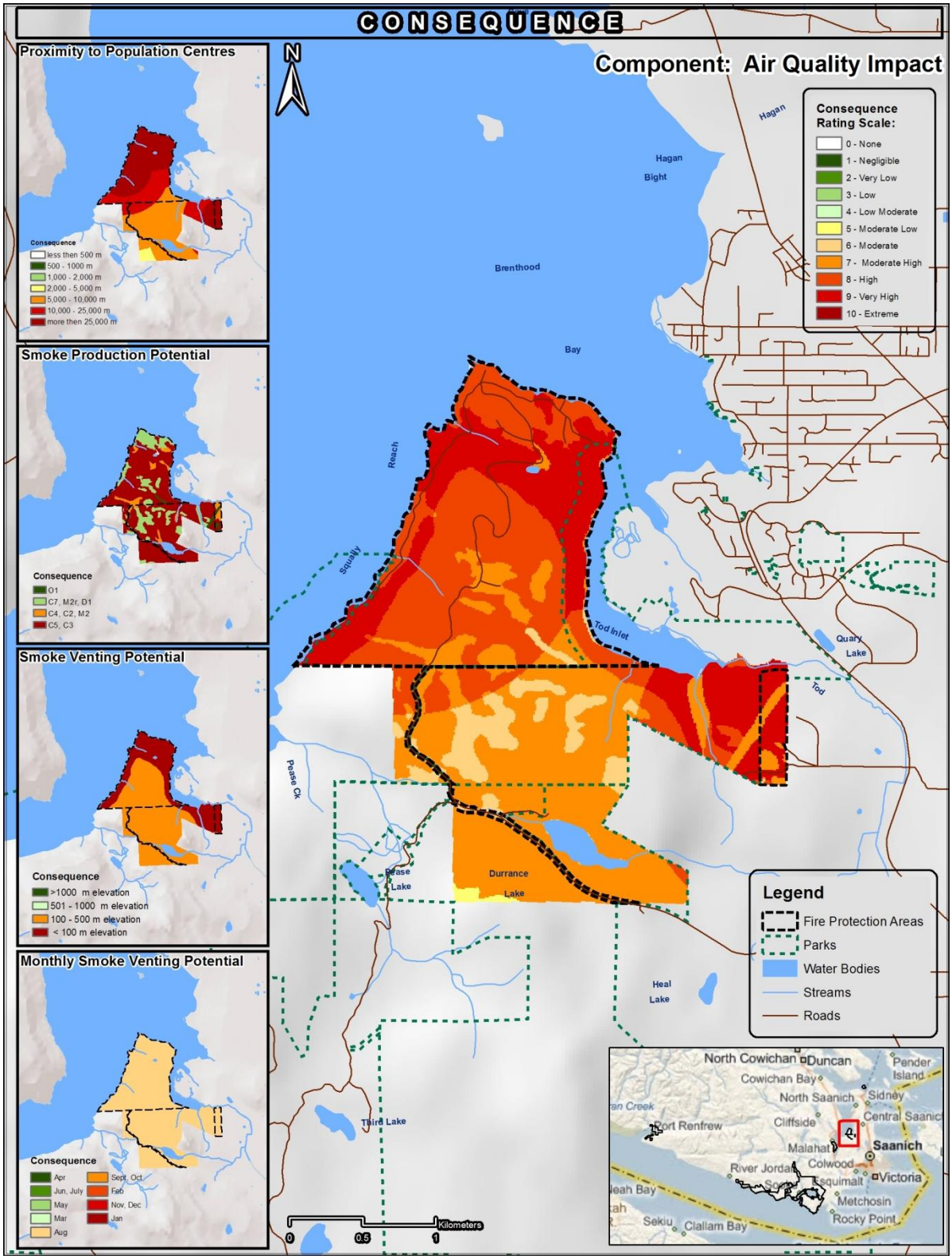
Visual Quality Impact (Consequence)



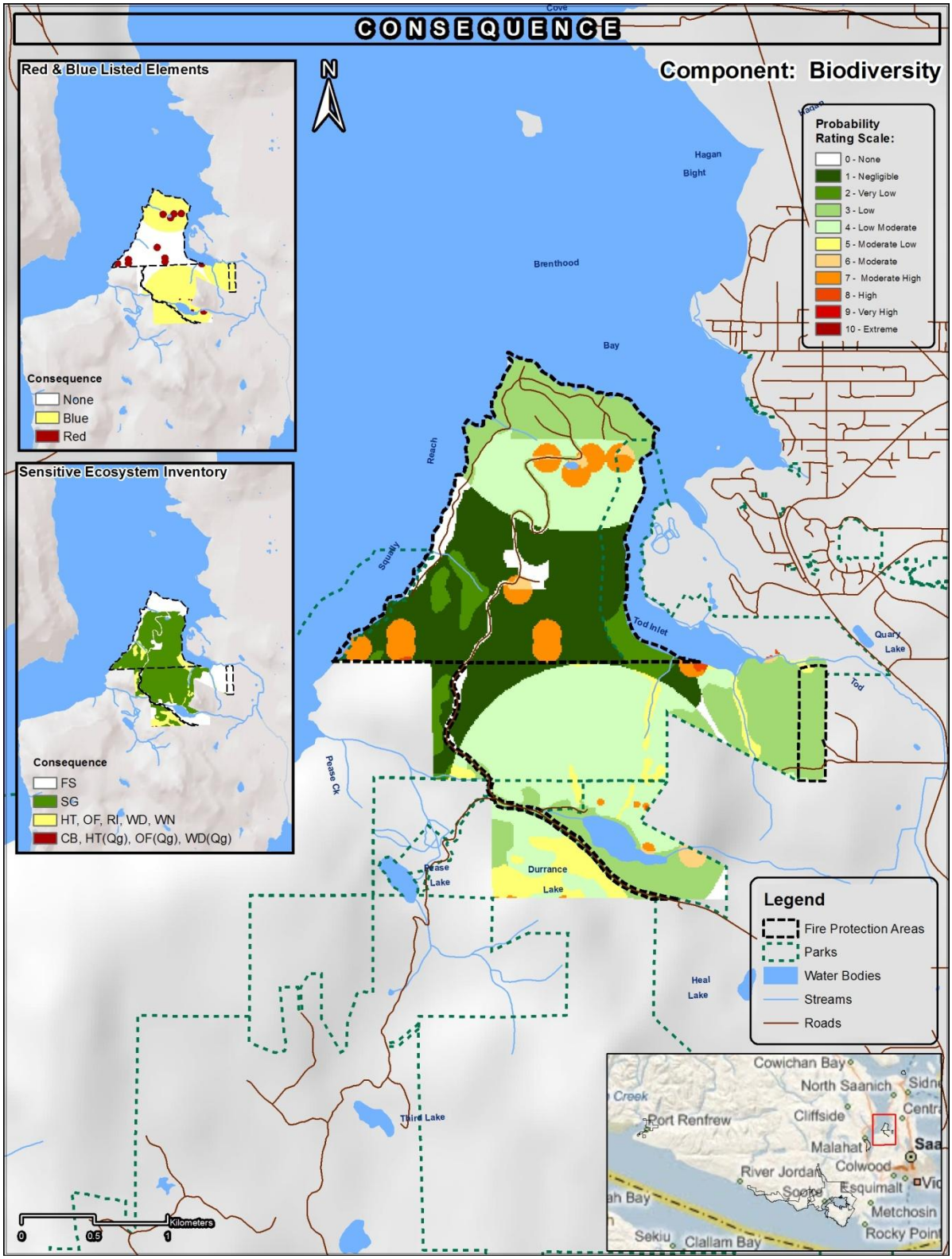
Recreation (Consequence)



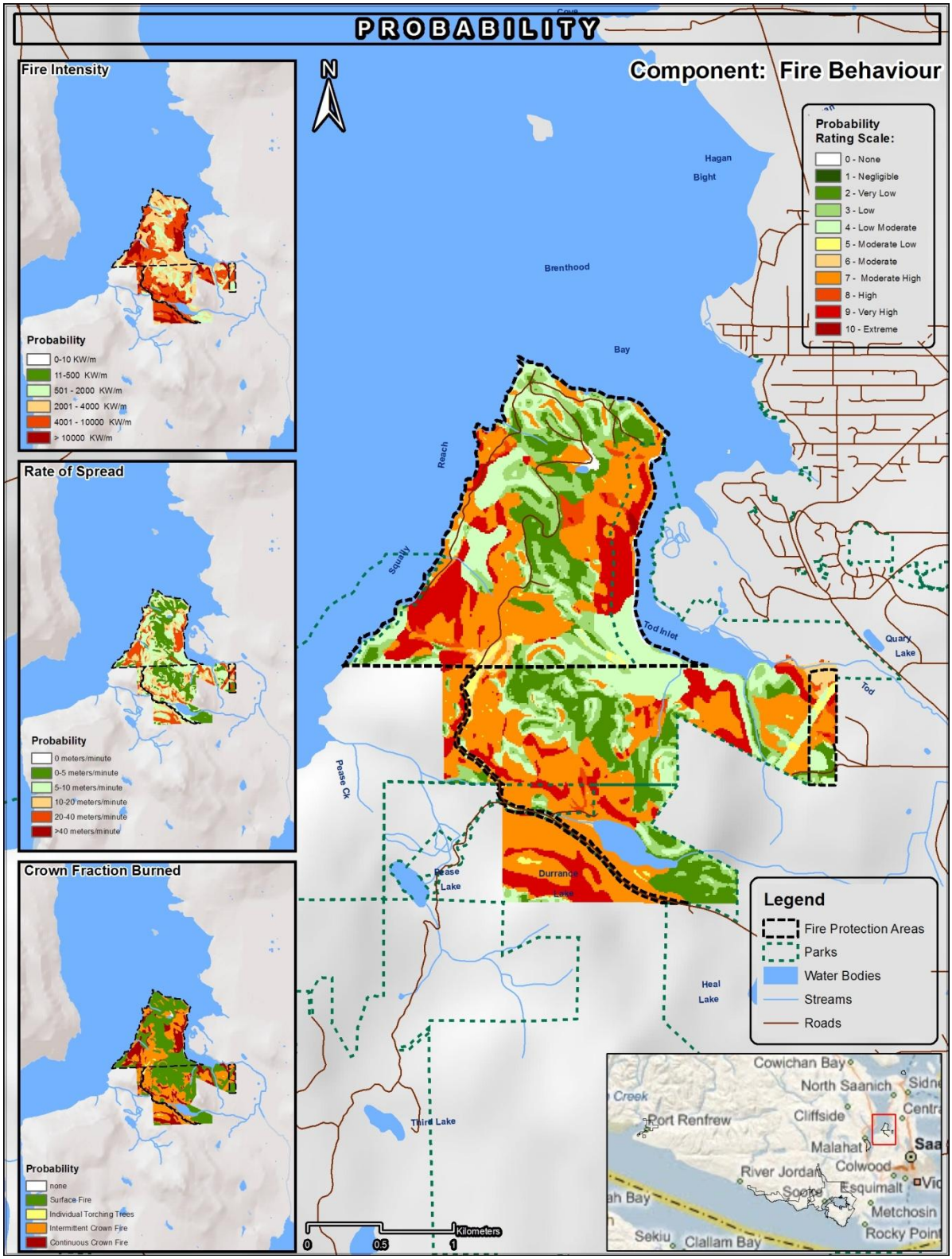
Air Quality Impact (Consequence)



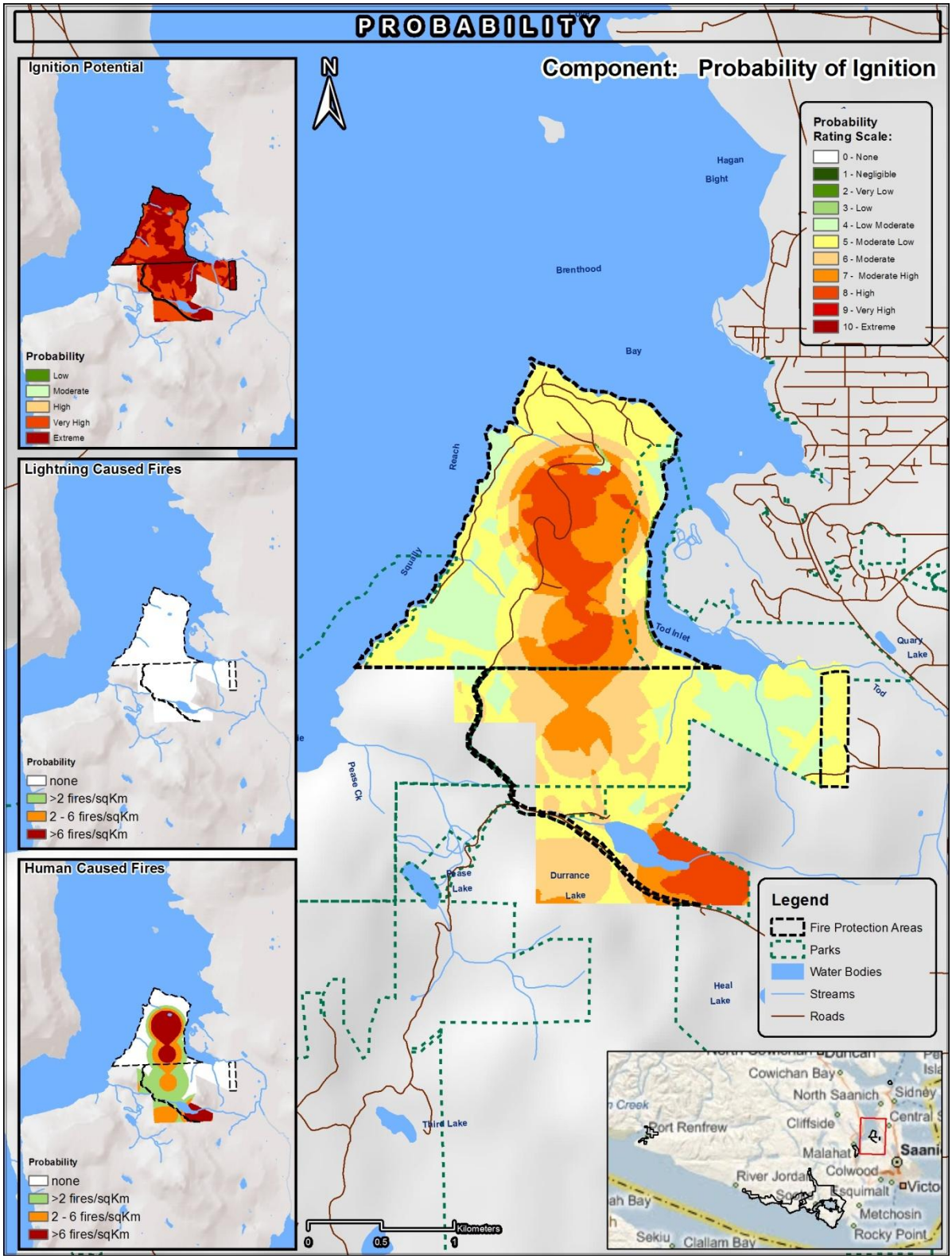
Biodiversity (Consequence)



Fire Behaviour (Probability)



Probability of Ignition (Probability)



Suppression Response Capability (Probability)