Coombs-Hilliers

COMMUNITY WILDFIRE PROTECTION PLAN

SFC

Prepared by:
Strathcona Forestry Consulting

GIS mapping:
Madrone Environmental Services Ltd.

August 2011

Coombs Hilliers
Community Wildfire Protection Plan

Prepared for:
Coombs-Hilliers Fire Protection Area

Submitted by:
Strathcona Forestry Consulting

GIS Mapping by:
Madrone Environmental Consulting Ltd.

August 2011

This Community Wildfire Protection Plan was developed in association with:

BC Ministry of Forests and Range and Wildfire Management Branch	Union of British Columbia Municipalities
Regional District of Nanaimo	
Coombs-Hilliers Volunteer Fire Department  	

Administration	
Preparation:	
RPF Name *(Printed)* RPF No: _____	RPF Signature Date: _____

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Coombs-Hilliers

The rural communities of Coombs and Hilliers, together with nearby Errington, occupy Electoral Area "F", a sizable tract of land, much of it sparsely developed and forested, stretching across the Regional District of Nanaimo. This Community Wildfire Protection Plan (CWPP) focuses on Coombs and Hilliers. A CWPP has been previously prepared for Errington (District of Errington Community Wildfire Protection Plan, 2006).

Coombs and Hilliers, located roughly midway between Parksville and Port Alberni on the inland east coast of Vancouver Island, are characterized by their rural agricultural and forested settings. The communities have small, distinct central hubs along Highways 4 and 4A, around which rural residential lots and acreages, farms and pasture lands, resource extraction operations, forested parklands, and extensive privately managed forest lands extend across the gently undulating Nanaimo Lowland west to the foothills of the Vancouver Island Mountain Ranges.

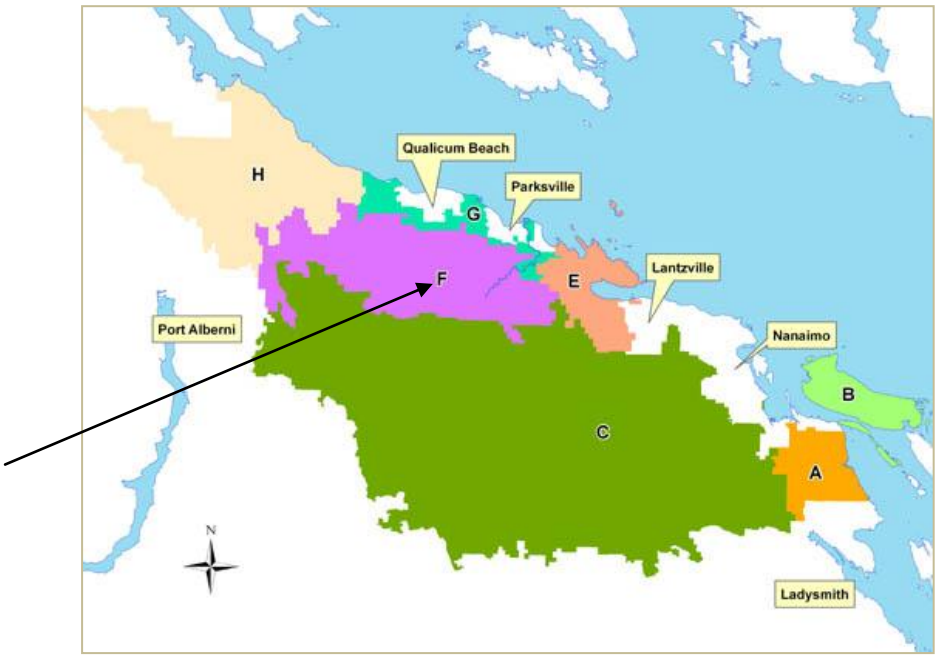


Fig. Regional District of Nanaimo. Coombs, Hilliers, and Errington are located in Electoral Area F.

Coombs and Hilliers are classified as wildland interface communities, where homes, businesses, industrial sites, parks, tourist facilities, and vital infrastructure are situated next to and/or among trees and other combustible vegetation. Fuels may be located along interface perimeters, where development and wildland fuels (vegetation) meet at a well-defined boundary, or, more often, in the intermix, where development and wildland fuels intermingle with no clearly defined boundary (*FireSmart*, Partners in Protection, 2003) (www.partnersinprotection.ab/ca).

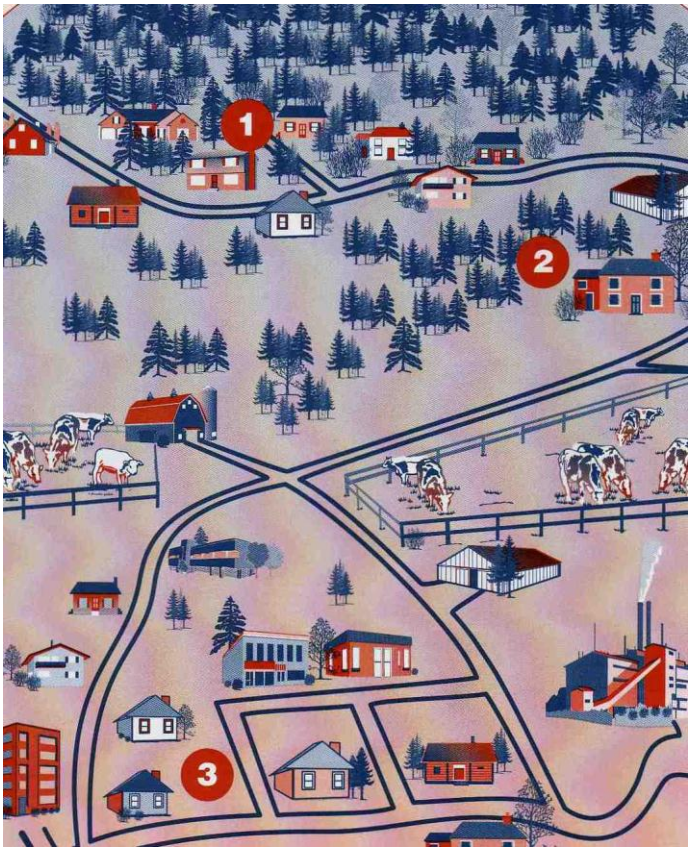


Figure 2. The interface area (1) is the first wave of buildings adjacent to dense wildland vegetation.

Intermix areas (2) are individual homes or pockets of buildings surrounded by wildland fuels (forest, brush, or grasslands). Intermix areas include "peri-urban" areas incorporating rural subdivisions and development.

In urban areas some distance from the interface (3), structures can be at risk from wildfire when strong winds carry burning embers. (FireSmart, 2003)

Three types of fire threaten property and natural resources. A structure fire can potentially spread to adjoining structures, but is not typically a large-scale emergency. Forest fires, caused by natural or human-made wildfires, result in the uncontrolled destruction of forested lands. Wildland interface fires combine the hazards associated with forest and structure fires. The hazard is bi-directional: wildfires can burn homes, and home fires can burn wildlands. Firefighters are typically trained to fight either structure fires or wildfires. Interface fires, like structural fires, require specialised skills.

Interface communities are found across Canada, wherever natural fuels exist next to human development. With increasing numbers of people living and recreating in rural areas, wildland interface fires constitute a growing threat. Interface fires are often very difficult to fight. Longer response times for out-of-the-way locations give the fires more time to get out of control. A major interface fire that destroyed much of the town of Slave Lake, Alberta, in the spring of 2011 forced many residents to evacuate with minutes' notice.

Photos. Interface wildfire, Slave Lake, Alberta, 2011.

For thousands of years, wildfires played a role in the ecological cycle of forests in many parts of North America, including Vancouver Island. Wildfires recycled forest nutrients and reduced natural fuel loading (vegetative material available for combustion). Over the last half century, human activities in and near wildland areas have resulted in aggressive fire suppression activities to protect life and property. As a result, the pattern of naturally occurring, low-intensity fires has been disrupted.

Human carelessness is the cause of over 90% of the wildfires on Vancouver Island (Wildfire Management Branch, Coastal Fire Centre stats, 2011). Recent data indicates one out of every eight fires on the coast was an interface fire. Within the last five years, wildfires on Vancouver Island and the Gulf Islands have impacted interface communities from Galiano and Saltspring Islands to Cumberland and Gold River (next page).

Photos. Recent, human-caused wildfires on Vancouver Island and the Gulf Island. Clockwise from top left: Wildfire near Nanaimo (2006), Cowichan Lake (2008), Gold River (2009), Bow Horn Bay (2005), Galiano Island (2006) (bottom photos), and Jordan River (2010).

The United Nations Intergovernmental Panel on Climate Change predicts global climate change will extend the duration of fire seasons and increase wildfire frequencies in fire-prone regions with mild climates (i.e., southeast Vancouver Island) (http://ipcc). On average, wildland fire threatens about 20 communities and 70,000 people annually in Canada; fire management costs Canada about $700 million a year (Canadian Wildland Fire Strategy). Both the area burned and the costs are expected to rise as a result of climate change. In British Columbia, fire records show that the wildfire season has been increasing in length for one to two days a year since at least 1980.

Fire fighting agencies confronting wildfire in the interface zone must contend with potential loss of life, property, infrastructure, and resources. Fire suppression in the interface zone is one of the most dangerous operations for fire fighters.

Photo. Wildland fire fighter uses drip torch to create a back fire against a wild fire.

Photo. Wildfire Management Branch fire fighting crew prepares to fly to a fire.

1.2 Community Wildfire Protection Plan Program

Community-based interface planning has been a basic tenet of British Columbia's Wildfire Management Branch for over four decades. After major interface fires at Penticton and Salmon Arm in the 1990's, the provincial Auditor General urged communities across the province to take action.

In the very warm and dry summer of 2003, public awareness of the danger of interface fires peaked as unprecedented wildfires struck British Columbia's interior communities. Firestorm 2003 destroyed 260,000 ha of forest, 334 homes and businesses, forced the evacuation of more than 45,000 people from their communities, caused $70 million in damages, and resulted in the loss of lives of three fire fighting airmen.

The Firestorm 2003 Provincial Review evaluated the damage and disruption caused by the interface fires of 2003 (www.2003.firestorm.gov.bc.ca). Recommendations made in the Review crossed all levels of government: federal, provincial, municipal and regional, and also included individuals.

Photos. Firestorm 2003, Kelowna.

The Firestorm report recommended the province of BC take a leading role in the development of strategic interface management plans in cooperation with local governments. In 2005, the provincial government launched the Community Wildfire Protection Plan (CWPP) program. The Community Wildfire Protection Plan program is directed at medium- to high-risk interface communities. The program is administered by the Union of BC Municipalities (UBCM) and funded by the Ministry of Forests and Range (MoFR).

The purpose of the Community Wildfire Protection Plan is to identify areas at high risk and assign planning priorities in an effective and efficient manner.

The objective of the Community Wildfire Protection Plan is to establish a cooperative framework to improve community safety, reduce the risk of property damage, and protect natural resources.

Community-based wildfire planning recognizes the vital role of local and provincial fire fighting agencies in fire prevention and protection.

Photos. Top: Coombs-Hilliers Fire Hall No. 2.

Bottom: Wildfire Management Branch crew investigates human-caused blaze at Thetis Lake Regional Park. (photo: Times Colonist, 2008).

1.3 Coombs-Hilliers CWPP

Preparation of the Coombs-Hilliers Community Wildfire Protection Plan involved a three-step process:

- Definition and mapping of interface wildfire threat areas
- Description of community protection measures and responsibilities
- Development of community action plan

Consultation and field inspections with the Coombs-Hilliers Volunteer Fire Department were conducted with several department heads. Liaison with the Regional District of Nanaimo provided valuable support.

Community planners face challenges as they attempt to balance the interests of all the authorities and residents who share responsibility for safety in the wildland urban interface. Information collected in the Community Wildfire Protection Plan is designed to guide development of fire awareness education, local planning tools, and management of forest lands adjacent to areas at risk. Prudent planning enables communities to anticipate and prevent risk. An effective community action plan shows how local government has the ability to take preventative measures to address interface and wildfire concerns.

Photo. Wildfire Management Branch firefighter suppresses human-caused fire, Thetis Lake Park, June 2011 (TC).

2.0 THE SETTING

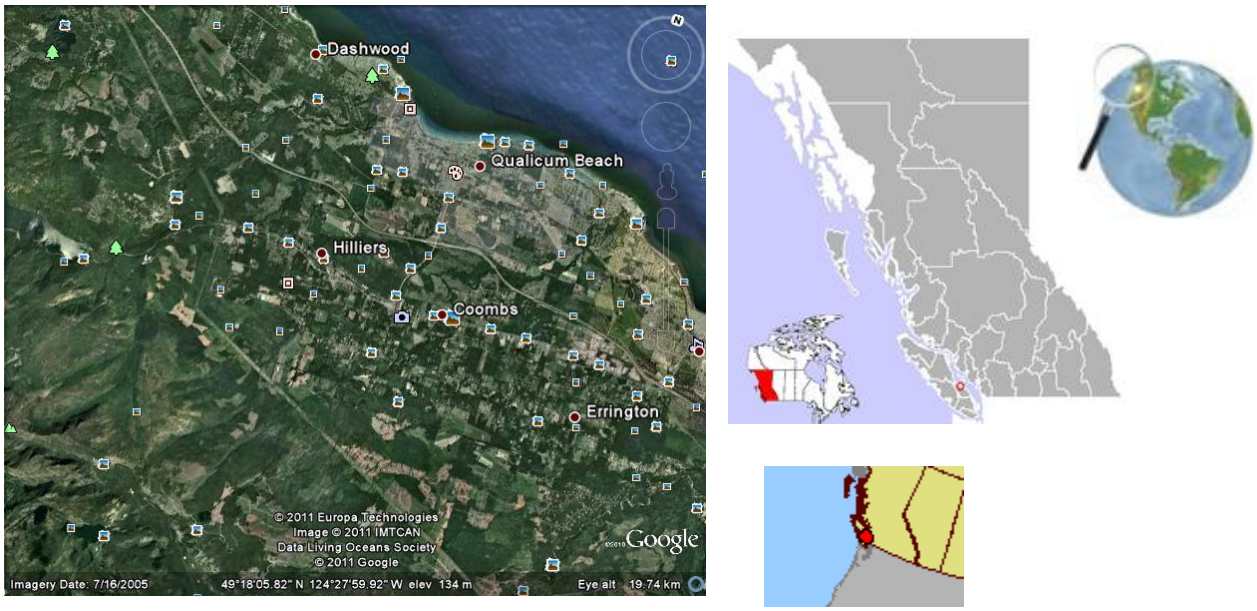
2.1 Community Profiles

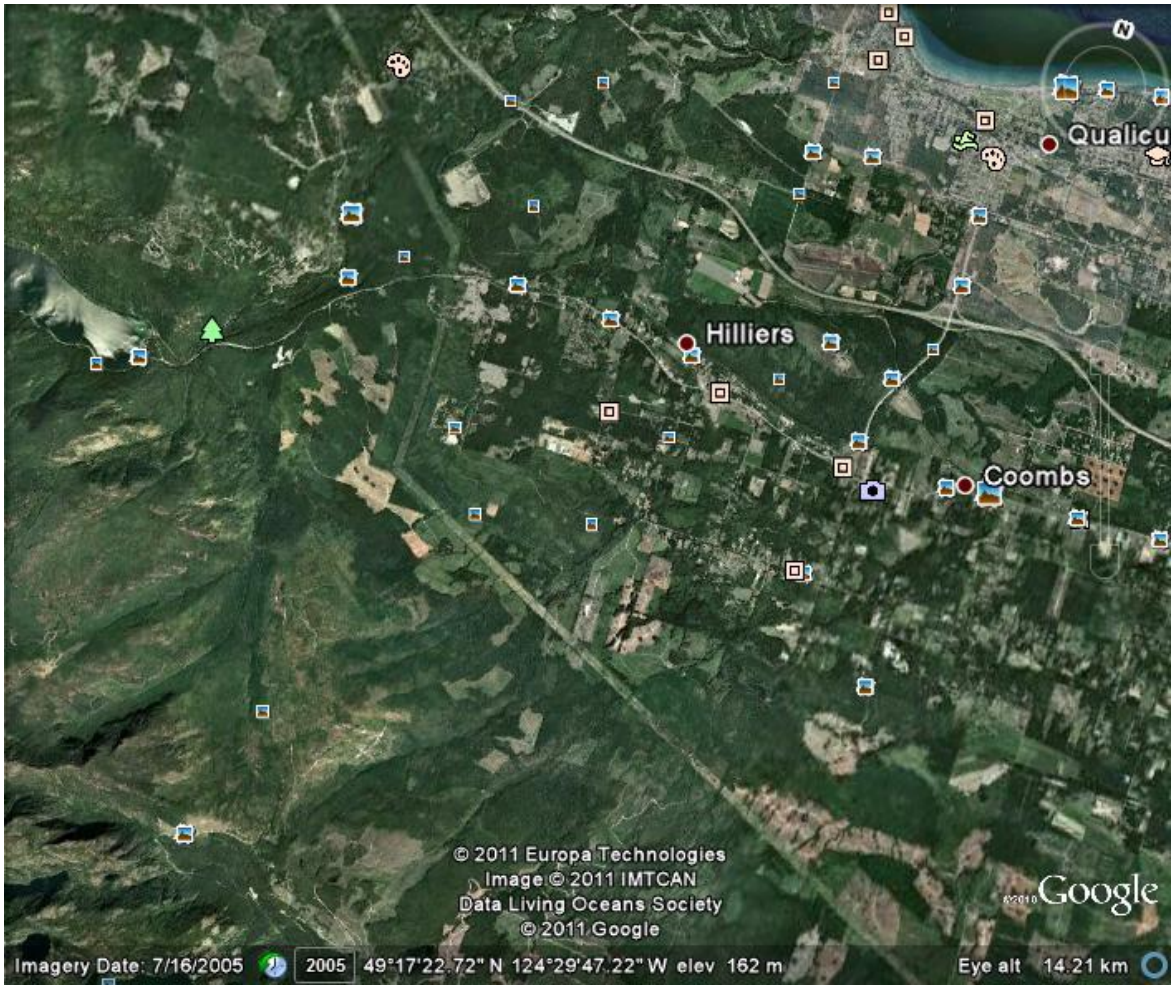
The Coombs-Hilliers Fire Protection Area (FPA) occupies 5,572 km^2 on the inner east coast of Vancouver Island. The Fire Protection Area extends westward along Highway 4A from the Errington Fire Hall No. 1 (Errington Road/Alberni Highway) to the Coombs/Qualicum junction, and continues along Highway 4 to Chalet Road on the eastern shores of Cameron Lake, for an approximate total length of 17 km (see next page). The FPA extends northward from the Alberni Highway approximately 2 km. The southernmost boundary of the FPA is approximately 5 km south of the Alberni Highway. Undeveloped, privately managed lands are included within, and surround much of the southern area of the FPA. A major BC Hydro transmission power line right-of-way passes diagonally through the southern portion of the FPA. According to one fire department source, the rationale for the boundary location is questionable: "it would appear an arbitrary line was drawn across the southern boundary of the FPA – the location of the line has no rhyme nor reason".

Coombs, an old pioneer community, is situated on Highway 4A, approximately 10 km west of Parksville. Once a stopping point on the stage route to Port Alberni, Coombs is best known nowadays for its country market (renowned tourist site) and annual Coombs Bluegrass Festival. The turnoff for Hilliers is located about a kilometer west along Highway 4A. An early English settler, Thomas Hilliers, gave the farming district its name (Milestones on Vancouver Island, 1973). The joint population of Coombs-Hilliers is approximately 3,500.

Photos. Older buildings from earlier years at Coombs-Hilliers.

The Official Community Plan (OCP) for Electoral Area "F" (Errington, Coombs, and Hilliers) provides a comprehensive set of objectives and policies for existing and future land uses, including direction on how Errington, Coombs, Hilliers will grow and change. By the year 2021, the population of Area "F" is forecasted to double.





Figures. Top: Google Earth image, showing location of Coombs, Hilliers, and Errington.
Bottom: Google Earth close-up of Coombs and Hilliers.

The OCP provides descriptions and mapping of existing and proposed land use designations in the Coombs-Hilliers area. Commercial and industrial activities are scattered throughout, with main concentrations along Highways 4 and 4A. The Coombs Village Centre contains a localised concentration of commercial and tourist related services along Highway 4A. A country market and associated tourist attractions at Coombs Village Centre draw hundreds of visitors through the summer months. A feature attraction for many visitors is the sight of goats grazing on the grass roof of the country market. During the summer, scores of cars may be seen parked on both sides of the highway around the market, and in parking areas set in trees behind the market complex.

Photo. Old Country Market at Coombs.

A fire department spokesperson commented that if a fire were to occur in the complex at the height of the summer tourist season, the resultant panic would cause "traffic chaos". Getting emergency access vehicles to the area would be difficult. The fire department cautioned that "Hall No. 1" [at nearby Ford Road] might not even be able to get their truck out". Several structures within the market complex are built of wood and other combustible materials. Prominent signs on buildings, fences, and trees throughout the market complex warn visitors that smoking is not permitted in the area.

Photos. Left: goats graze on the grass roof at Coombs Country Market as diners enjoy a summer lunch on the outdoor patio; right: several structures in the Coombs market complex have grass roofs.

Photo. "No smoking" signage at Coombs Country Market area.

The Hilliers Village Centre, located on Highway 4 to the west of Coombs Village Centre, contains a small mix of commercial and industrial services and smaller residential lots. The Coombs Village Area and Hilliers Village Area are designated in Rural Separation Boundaries.

Photos. Left: Coombs Village centre; right: Hilliers Village centre

One Industrial Lands Area in Coombs-Hilliers is designated on Clarke Road (Long Hoh Sawmill). A fire department spokesperson noted that the sawmill and other industrial activities in the area "generally comply with regulations in stark contrast to back-yard operators".

Photo. Long Hoh sawmill.

Rural Lands (parcels greater than 2.0 ha) at Coombs-Hillier have a variety of land uses, ranging from rural residential to commercial and industrial activities. Rural residential acreages (up to 40 acres) are dispersed throughout much of the FPA. A variety of commercial ventures, ranging from different types of plant nurseries to food processing facilities (i.e., sausage manufacturing and chocolate production) to tourist attractions and facilities (i.e., Butterfly World) are found in the area.

Small-scale industrial operations (e.g., small lumber mills, log processing plants) are also located in the area, (i.e. Tralee Road). According to a fire department spokesperson, some of these smaller industrial operations present a number of challenges to fire protection, including accumulations of saw dust piles around mills during the summer fire season, and tight access for emergency vehicles (i.e., Tralee Road, Chatsworth Road). Chatsworth Road, which has mixed-use, with home-based sawmills and home-based businesses, provides a challenge to emergency access, as noted a fire department spokesperson, because it is "1-way in/1-way out".

Photos. Smale-scale industrial and commercial operations: left: log mill; middle: woodworks; right: lumber company.

Pockets of small-lot residential areas are dispersed throughout Coombs-Hilliers, including along Highways 4 and 4A. Whisky Creek subdivision (small subdivision at Poplar Way) is the most densely populated neighbourhood in the FPA.

Photos. Whisky Creek subdivision, centred around Poplar Way, is the most densely populated area of the FPA.

Mobile homes and mobile home parks are dispersed on either side of Highways 4 and 4A, at Melrose Road, Brooklin Lane, Rinvold Road, Van Horne Road, Virginia Road, and across from an auto salvage near the Errington border. The fire department has been called to respond to two structural fires involving mobile homes at the trailer park off Whibley Road. Forest cover and brush surround a number of these mobile home parks. Similar to other jurisdictions on Vancouver Island, medical calls to mobile home parks at Coombs-Hilliers tend to be high in proportion to the rest of the community.

Photo. Mobile homes on Melrose Road.

The province of BC has recently allowed the release of large tracts of private forest lands from forest management lands. Thousands of hectares have been sold, often by the real estate divisions of forest companies, for residential developments or mixed use commercial developments. The Regional District of Nanaimo, through direction from the Area "F" OCP, is responsible for determining the future use and density of private forest lands at Coombs-Hilliers.

At the south end of Pratt Road, a large tract of forested land once managed by TimberWest is being developed into rural residential acreages.

Photos. Residential acreages for sale – formerly TimberWest forest lands, Pratt Rd.

Many areas of residential development, in the words of a fire department spokesperson, are "tucked right up against the forest". Examples include Marples Road, Melon Road, Winning Way, Malcolm Road east, Chatsworth Road north, Pratt Road.

Photos. Residential "intermix" is common at Coombs-Hilliers.

Designated Resource Lands in the area are used for agriculture, natural resource extraction, forestry, and environmental conservation opportunities. Many farms and horse ranches in the Coombs-Hilliers area have well-maintained open fields that effectively move the edge of the interface away from buildings in the locale.

Photos. Farms with cultivated fields, such as these ones at Coombs-Hilliers, are effective in moving the edge of the interface away from buildings.

Several aggregate operations are located in the Coombs-Hilliers area. These facilities, where surface and above-ground fuels have been removed, are also effective in moving the edge of the interface away from structures in the general area.

Photos. Aggregate operations at Coombs-Hilliers.

Forestry operations in the Coombs-Hilliers area include small Crown operations (i.e., woodlots) and large private tenures. According to a fire department spokesperson, better communication is required to advise neighouring residents of woodlot activities. When a portion of the woodlot south of Sun King Road was harvested a few years ago, no notice was given to nearby homeowners, many of whom were unaware they lived next to Crown land. There are no signs on the adjacent road frontage to indicate the forest lands are in a managed woodlot.

Photo. Crown woodlot in the Shawn Road and Sun King Road area.

The Coombs-Hilliers Volunteer Fire Department, like many other fire departments on Vancouver Island, has growing concerns about fire protection of private forest lands within, and adjacent to Fire Protection Areas. Changes in forest land ownership and increased security due to liability provide challenges for rural fire departments trying to contact key forestry personnel in case of emergency. Locked gates on logging roads, while helping to protect resources and equipment, are an impediment to emergency access. In reference to Island Timberlands operations in the Coombs-Hilliers FPA, a local fire department official noted it is difficult to acquire keys for emergency access. The department added, "we're responsible for rescue/initial fire protection….we do the best we can".

Photos. Left: private forest lands in south part of FPA. Right: gated logging road.

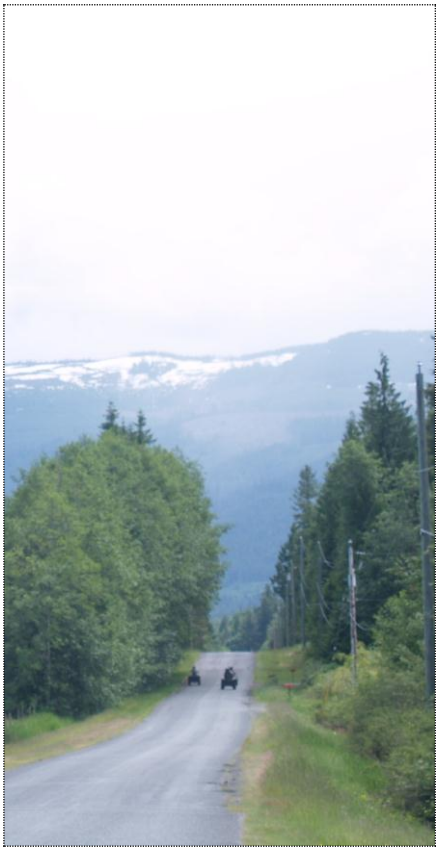
Park Lands at Coombs-Hilliers include one provincial park (eastern fringes of Little Qualicum Falls Provincial Park), several smaller (often unsigned, undeveloped) community parks, land covenants, Crown land park land donations, and RDN licenses to occupy for park purposes.

Photos. Upper left: Little Qualicum Falls Provincial Park; upper right: Harris Crescent park; Bottom: undeveloped forested park south of Whisky Creek store

Hamilton Marsh, a biologically rich wetland/forest complex, is considered a wildlife refuge by many local residents, and has not been formally recognized as a park, although a portion of the area is Regional Park. The fire department is regularly called to attend to abandoned campfires at Hamilton Marsh.

Photos. Left: Hamilton Marsh; right: garbage at parking area for Hamilton Marsh.

A network of designated trails along gazetted rights-of-way and through park corridors at Coombs-Hilliers is used by hikers, mountain bikers, and horseback riders. Unofficial trails in the area are used extensively by hikers, mountain bikers, horseback riders, hunters, and all-terrain vehicles. Many of these well-used, undesignated trails to and through forest lands are accessed from road ends and the power line right-of-way (i.e., Chatsworth Road, Kriscott Road). Some of these access points, notes the fire department, have become party spots and garbage dumps.



Photos. Top left: forest trail at Hamilton Marsh (N.B.: surface fuel loading); top right: Dogleg Road (roadside trail corridor); bottom left: unlicensed quad vehicles on public road; bottom right: southern end of Chatsworth Road.

Many of the small community parks and trail rights-of-way in the Coombs-Hilliers area are undeveloped; there is no signage to indicate ownership (i.e., Hilliers Road/Dogleg Road; Winning Way/Chatsworth; Melon Road/Howard Road). If a fire were to occur at one of these undeveloped parks, the fire department said it would "need to know about a call in to RDN Parks".

There are four private campgrounds in the Coombs-Hilliers area. The provincial campground at Little Qualicum Falls Park lies just outside the FPA, but may be patrolled by the Coombs-Hilliers Volunteer Fire Department during extreme fire weather to check that campers are complying with campfire bans.

Issues with some of the private campgrounds have kept the fire department busy during summer fire seasons. In the words of one fire department official, the campgrounds tend to promote "a lot of inappropriate behaviour here" with "rowdy, drunken campers parked in the midst of dry forests on hot summer weekends".

Photos. Top: Whisky Creek Campground. Bottom: Coombs Country Campground.

The Coombs Country Rodeo is held annually at the Coombs Country Campground, where parking is available for 86 vehicles. The site has a small lake, but, if a fire were to occur during the popular summer rodeo, the fire department cautioned it would be "leery of drafting from the lake". In an emergency, the fire department would send people out by foot.

Photos. Managed fuels at Coombs Community Hall.

A good example of FireSmart fuel management is found at the Coombs Community Hall at the Coombs Country Campground. Surface fuel loading has been reduced around the facility. If a cigarette were to be thrown on the ground, there is a low likelihood of fire starting and/or spreading.

The private campground at Chalet Road, beside Cameron Lake, contains about 70 campsites. The fire department commented favourably on the facility's management's efforts to ensure campers comply with MoFR campfire bans.

Photos. Private campground at Cameron Lake.

2.2 Transportation, Communication, and Community Infrastructure

Highways 4A and 4, which connect the east coast of Vancouver Island with Port Alberni and points on the west coast, run through Coombs-Hilliers area. The inland Island Highway runs through a small portion of the northeast section of the FPA.

Photo. Highway 4 passes beside Coombs-Hilliers Fire hall No. 2.

As noted in the OCP, "remaining roads [in Area "F"] are characterized by a standard to narrow road surface with no provisions for pedestrian or bicycle travel." The OCP also noted (in 1999) the "Ministry of Transportation and Highways (MoTI) has designated… the approximate location of proposed major roads". Several smaller roads have no cross streets (i.e., Palmer Road, McLean Road, Tintern Road, Kerr Road). When the fire department responds to calls from these areas, members "have to get a map number, and get the nearest cross street".

Photo. End of maintained public road – Palmer Road.

When highway rights-of-ways are not regularly mowed, a fire in dried grass and brush beside the highway can be fanned by the passage of large trucks. These fires can quickly "jump" to nearby vegetation. The fire department is frequently called to respond to fires caused by cigarettes thrown onto dried grass beside the highways.

Photo. Highway right-of-way in spring.

Trucks hauling hazardous materials regularly travel on the highways through the area. A fire department spokesperson recalled a truck carrying hazardous materials "went into the river by Little Qualicum – the tanks had to be purged". (Specific details were not available for the purposes of this report.)

Local roads vary from wide, straight travelled ways with good egress (i.e., Howard, Palmer, Pratt Road loop) to steep and/or narrow roads (i.e., Koen Road) with 1-way in/1-way out access (i.e., Winning Way, Dogleg Road). The fire department remarked, "We can't get a pumper truck up Koen Road. We'd have to drag hose up for two hours".

Photo. Local, gravel road with wide surface.

Driveway accesses throughout the FPA vary from "some well-maintained driveways with decent access to some that don't" (C-HVFD). The fire department would like to see turnouts on long driveways.

Street addresses are not always evident, or even present. At Brooklin Lane, several homes do not have correct street addresses.

An abandoned rail line passes through the northern portion of the area. Vegetation along the rail line is not maintained. The fire department is often called to respond to human-caused fires along the rail line. Speeder groups using the rail line, notes the department, do not generally cause problems.

Photo. Rail crossing line on Hilliers Road South.

Photo. Brush along rail line near Little Qualicum Falls Park.

A BC Hydro power transmission line right-of-way passes diagonally through the southwestern portion of the area, crossing Highway 4 just west of the Whisky Creek Trading Post. The fire department is often called to respond to human-caused fires along the power line right-of-way. Kriscott Road and several other roads in the area provide access to the power line right-of-way. As noted earlier, several of these access points have become party sites and dumping grounds for garbage. Garbage is often seen dumped, too, at points along the Hilliers S. Road.

Photos. BC Hydro power transmission line in the area.

Photos. Garbage dumped at road accesses along power transmission line at Coombs-Hilliers.

There are no airports or communications towers in the area.

Intentional car fires are a constant problem at Coombs-Hilliers. The fire department is regularly called to respond to stolen cars "torched at gravel pits and dead end logging roads".

Emergency Reception. The Arrowsmith Agricultural Association building at the Coombs fairgrounds has been recently designated as an Emergency Reception Centre. Built to seismic standards, the facility is equipped with a kitchen.

Adept in emergency situations, the fire department recalled the windstorm in November 2007 that brought down ninety trees at the Coombs Country Campground. When BC Hydro was overtaxed and could not respond promptly, the local fire department sent its volunteer firefighters to clean up the trees that had blown down. As the community hall was not built at the time, approximately twenty three people were evacuated to the Qualicum Civic Centre.

Photos. Wildfire suppression.

3.0 GOVERNMENT INFRASTRUCTURE

The Regional District of Nanaimo includes the cities of Nanaimo and Parksville, the Town of Qualicum Beach, the District of Lantzville, and a number of unincorporated communities, such as Coombs and Errington, in eight electoral areas. Coombs, Hilliers, and Errington are located in electoral area "F".

The Regional District of Nanaimo provides regional governance and services, including regional parks, regional planning, and emergency 9-1-1 services. In Regional Districts in British Columbia, residents pay only for those services provided to the Electoral Area or Municipality in which they reside. The RDN provides services directly to Electoral Area "F". These services include administration, building inspection, emergency planning, bylaw enforcement, water utilities, and fire protection.

3.1 CommunityValues

Community values guiding decisions on local land use and development at Errington-Coombs-Hilliers are stated in the Official Community Plan for Area "F". Management of the interface zone at Coombs-Hilliers is directly and/or indirectly affected by these community values, including:

- support for only a low level of regulations
- protection of the "quality of life", rural nature and privacy found in Area "F"
- support for no further sprawl in rural areas
- recognition of the economic and environmental benefits of forested lands
- support for the public's use of forested lands for recreational enjoyment
- recognition of the need to safeguard environmentally sensitive areas
- support for the creation of an integration park and trail system in the Plan area
- support for road design and construction standards that meet the safety and transportation needs of the community

3.2 Tools Available to Local Government

Only a small fraction of wildfires intrudes into areas of human settlement, but the impact of wildfire can be devastating to life and property. Governments can use a variety of tools to manage interface fire hazards. Key actions from local government, working in concert with local and provincial fire fighting agencies, can play a lead role in wildfire risk reduction in the interface zone.

Tools available to local government to manage the interface include:

- public education and involvement
- preventative measures at time of rezoning and subdivision, including planning, building, and servicing
- fire protection and emergency preparedness

3.3 Public Education and Communication

The approach adopted by local government towards a public education program should be tailored to the severity of the interface fire risk, the nature of the community, and the availability of resources. Involving and informing the public of the interface fire risk is critical to garnering public support for any measures that government may choose to enact as well as assisting in empowering individuals to undertake their own measures to protect their homes (City of Langford, 2001. *Addressing the Interface Fire Hazard*).

Effective communication about fire prevention and protection presents a particular challenge to fire departments in rural, unincorporated electoral areas. Some fire departments (i.e. Errington) have sufficient resources to produce a news bulletin a couple times a year. The Coombs-Hilliers Fire Department stated it does not currently have a ready means of relaying fire department news to residents. "We don't have a way of communicating", notes the department, "we don't have a newsletter". The fire department foresees the need "for a pamphlet that could be mailed out every spring…" A fire department spokesperson suggested that pamphlets could be inserted into tax notices or amenity bills. The fire department spokesperson added that short features on fire protection and prevention could be aired on Shaw Cable or A-Channel. For example, the feature could demonstrate fuel reduction treatment around a residence on a heavily wooded property.

Other ideas for communicating fire prevention issues to the public include setting up interactive displays with the RDN at the Coombs Country Rodeo and the Coombs Fall Fair.

The fire department also suggested the Regional District of Nanaimo would benefit from a liaison committee of fire chiefs from across the district meeting with the Regional Board on a quarterly basis.

3.4 Preventative Measures as Planning Tools

A range of planning tools is available to local government to manage development in the interface zone. Most of the planning tools are applicable only to new development. These planning tools include:

- **Development Permits and Development Permit Areas**. A Development Permit Area (DPA) is a set of development regulations pertaining to a specific area as specified by the Official Community Plan. Any proposed building and subdivision within a DPA requires the issuance of a development permit. The authority for local governments to establish DPAs is set out in the Local Government Act, Sections 919.1 and 920.

  The purpose of a Development permit area (DPA) may be to:

  - protect development from hazardous conditions
  - protect the natural environment, its ecosystems and biological diversity
  - revitalise an area in which a commercial use is permitted

- establish objectives for the form and character of intensive residential development, and/or to establish objectives for the form and character of commercial, industrial, or multi-family residential development

- establish objectives to promote energy conservation, water conservation, and reduce greenhouse gases

The flexibility of DPA guidelines allow local government to fairly exercise its discretion in granting or refusing a permit on a case by case basis, while providing objective principles to guide conditions for approving or refusing a DP application.

A growing number of communities in British Columbia has applied local interface mapping to OCP guidelines to create Development Permit Areas for wildfire.

It should be noted Development Permit Areas only address new development and changes to existing development.

The RDN Area "F" OCP does not contain Wildfire Development Permit Areas for wildfire.

- **Covenants**. Section 219 of the Land Title Act permits local governments, including regional districts, to request Section 219 covenants to manage how land is subdivided and built upon. Local governments usually make these covenants a condition of a development permit, subdivision approval, and/or building permit. The covenants can be used to address interface fire protection measures, such as vegetation setbacks around residential structures, types of building materials, and construction design and criteria.

  Existing lots and structures are generally not subject to covenants. Covenants are difficult to enforce over time.

- **Rural Land Use Bylaws**. Rural Land Use Bylaws (RLUB) are a planning tool only available to regional district governments. RULBs, which cannot contain DP areas, allow for the combining of zoning, subdivision control, and servicing standards in one bylaw. Items covered under RULBs generally have little relevance to wildfire.

- **Recreation Planning**. Local governments can use park planning and trail planning to minimise the risk of interface fires. Trails can be designed to accommodate fire response vehicles and fire department response.

- **Engineering Tools**. Infrastructure planning tools include Subdivision and Servicing bylaws to regulate by bylaw the provision of works and services to lands that are being subdivided; and local Building Bylaws to regulate the construction of buildings. Until October 1, 2010, no residential building inspection and no enforcement of the building code took place in Area "F". A fire department spokesperson noted that substandard buildings present potential hazards to fire fighters.

  On October 1, 2010, building inspection in Area "F" was officially sanctioned to cover permits for new commercial and agricultural buildings.

As of April 1, 2011, building inspections were also brought into effect for residential building footings.
A fire department spokesperson noted a rash of residential building immediately before April 2011.

Across Coombs-Hilliers there are residential structures that are not built to the standards of the BC Building Code. A fire department spokesperson noted that if the department is called to respond to a fire at a structure that is deemed unsafe, the lives of firefighters "would not be jeopardized".

There is no bylaw enforcement at Coombs-Hilliers.

Photo. A number of residential structures at Coombs-Hilliers are not built to building code standards.

- **Burning Regulations.**
  Coombs-Hilliers.
  There are no local burning bylaws at Coombs-Hilliers.
  Burning regulations default to the Coastal Fire Centre.
  A Coombs-Hilliers fire department spokesperson noted that as the weather warms during the summer fire season, there is a general tendency at Coombs-Hilliers for people to burn "just before a coastal fire ban comes into effect". Said the fire department spokesperson, "I don't understand the mentality".

  Calls to respond to illegal burning result in warnings. The fire department reports repeat offenders to conservation officers and the RCMP, who are authorized to issue tickets.


Photo. Wildfire smoke.

Like other fire departments across the province, the Coombs-Hilliers department noted that since the 2003 Firestorm, people are much more inclined to call in sightings of smoke.

3.5 Police Protection

The Oceanside RCMP is responsible for police protection of Coombs-Hilliers. Following protocol, the RCMP work to assist the Coombs-Hilliers Volunteer Fire Department at fire calls.

3.6 Fire Protection

Fifteen fire departments operate 23 fire halls throughout the RDN, providing fire protection for four municipalities and most unincorporated areas. Nine of these fire departments are administered and financed by municipalities and improvement districts, and operate independently of the RDN. The remaining six fire departments, including the department at Coombs-Hilliers, are volunteer fire department societies. The volunteer fire department society provides fire protection and emergency response services. The RDN collects property taxes for the fire department, and provides financing for its operation and capital expenses. The volunteer fire department society is responsible for day-to-day management of the fire department, and operational guidance to the volunteers. The fire department society also advises the RDN of capital improvement requirements of the department.

Fire Services Committee. RDN's Fire Services Committee reports to the Regional Board. Fire chiefs and society members are members of the committee.

Photo. Officials from the Coombs-Hilliers Volunteer Fire Department (C-HVFD).

Coombs-Hilliers FPA. The Coombs-Hilliers Volunteer Fire Department, which operates as one volunteer department, responds to emergencies in Coombs and Hilliers. Recent addition of the Chalet Road area at Cameron Lake to the Coombs-Hilliers Volunteer Fire Protection Area extended the western boundary of the FPA beyond the typical 8 km limit of a small volunteer fire department. The department notes that haul distance to Chalet Road at the "end of the Fire Protection Area, is almost 14 km". Significant portions of TimberWest private forest land – where there are no houses – also fall within the Coombs-Hilliers FPA.

The Coombs-Hilliers FPA defines the limits of local fire response. Rescue response extends beyond the FPA boundaries west to Cathedral Grove, and north to the Inland Island Highway (19) to connect with Town of Qualicum first responders.

A portion of the Melrose Road area (including residential acreages and mobile home parks) on the north side of Highway 4 is included within the FPA. Whisky Creek Forest Service Road and the Meadowood Dashwood subdivision west of Hilliers are out of the FPA. Under mutual aid, the Coombs-Hilliers Fire Department would attend to the Meadowood area (Dashwood FPA).

Fire halls. The Coombs-Hilliers Volunteer Fire Department operates two fire halls:

Coombs-Hilliers #1 Fire Hall (original hall – built in 1967 with a log-stick frame)
992 Ford Road

Photo. Fire Hall No. 1.

Coombs-Hilliers #2 Fire Hall (training ground)
3241 Alberni Highway

Photo. Fire Hall No. 2.

Response Time. Average response time to most areas of the FPA is 7-10 minutes from page out. Response times can vary according to time of day and year. Response from the volunteer department is generally better after 6 pm.

The longest response time in the FPA is to Chalet Road (12-13 minutes). As noted by a fire department spokesperson, if a fire occurred at the Chalet Road area, the responding crew would

have to unlock the gate, lay a hose line, and "hope ….. nothing burns up". The department can draft from Cameron Lake.

A fire department spokesperson noted the Cameron Lake campground's management works hard to ensure campers comply with MoFR campfire bans.

The Coombs-Hilliers Volunteer Fire Department provides protection to Little Qualicum Falls Provincial Park "upon request". The department is not mandated to provide enforcement. Provincial and community RDN parks are typically maintained by contractors who would call the fire department in case of fire.

Fireflow and Suppression Equipment. Other than a small, somewhat outdated community water system at Whisky Creek's Carson Road area, there are no hydrants in the Coombs-Hilliers FPA. The hydrants at Carson Road do not meet flow rates as to NFPA (National Fire Protection Association) standards. These outdated hydrants with outdated ports have low pressure and low volume, and are on 4" lines. Water for fireflow at Coombs-Hilliers must be hauled by tankers. The use of tenders and portaponds is standard practice at the department. In some situations, water may be hauled from Errington or Qualicum Beach.

The Coombs-Hilliers Volunteer Fire Department has 2 engines and 2 tankers:

Engine 105: 800 gal.
Engine 104: 1,000 gal
Tanker 102: 1,000 gal
Tanker 101: 3,600 gal

The department also has a 4WD rescue truck.

Call Volume. Average annual call volume for the Coombs-Hilliers Fire Volunteer Fire Department is 200. Approximately 40% of the calls involve traffic (motor vehicle accidents). Another 40% typically entail medical emergencies. Ten percent of the calls entail a variety of causes, while 10% result involve interface fires.

Calls to the Coombs-Hilliers fire department (and to Dashwood, Bow Horn Bay, Errington, and Nanoose) are relayed via a repeater at Cameron Lake.

Fire Department Responses. Activities of the Coombs-Hilliers Volunteer Fire Department include suppression, rescue, mutual aid, hazardous materials awareness response, first responder, general emergency preparedness planning, fire prevention, and public information. The department conducts S100 (basic forest fire suppression and safety) for its members three times a year. The department's deputy is an S100 instructor. Two of the members have S215 (advanced forest fire suppression). The department conducts 1-2 swift water rescues a year (typically at Little Qualicum River). The department does not do high angle rescues.

The Coombs-Hilliers Volunteer Fire Department is currently updating its pre-fire planning for Coombs Village Centre and the Long Hoh saw mill. As noted earlier in this report (Sec. 2), a fire at the Coombs Village Centre during the height of the busy summer tourist season would, in the

words of the fire department, "cause traffic chaos". There are no sprinklers on the grass roofs at the market and surrounding buildings. If a fire occurred, said a fire department spokesperson, "the roof would likely collapse under the weight of the water used for fire suppression". In the case of a fire or other emergency, the fire department would ensure "other resources called in" would include the RCMP, BC Hydro, the highway maintenance contractor, and mutual aid. Evacuation of large amounts of people, noted the fire department, "would be difficult". Efforts would be made to move people to a nearby pub and parking lot.

The Long Hoh sawmill, which produces specialty wood, recently extended an invitation to the fire department to tour its facilities. The sawmill is equipped with its own water system, pump, and hydrants. In the summer, logs are wetted down with sprinklers in order to reduce the fire hazard.

One summer a few years ago, recalled a fire department spokesperson, quick response by the Coombs-Hilliers Fire Department to the Coombs Country Market found the structure "fully engulfed". The fire started with an undersized hydro line.

Mutual Aid. The Coombs-Hilliers Volunteer Fire Department is responsible for all fires within its fire protection area. The department has mutual aid agreements with Errington and Dashwood. Dashwood and Coombs-Hilliers share calls in adjoining areas. The Coombs-Hilliers Volunteer Fire Department has a Memorandum of Understanding with the Wildfire Management Branch ("Forestry") to provide mutual aid in forested, undeveloped areas. At wildland forested interface areas, the department can request additional assistance from the Wildfire Management Branch.

Community Volunteerism. Like volunteer fire departments across Vancouver Island, the Coombs-Hilliers department is committed to the community it protects. The department regularly visits local elementary schools to promote fire safety during the annual Fire Prevention Week.

Fire trucks from Coombs-Hilliers join emergency response vehicles from adjoining jurisdictions at the annual Canada Day parade in Parksville. Later in July, the department prepares a pancake breakfast at a local car show.

Photo. Dashwood gets into position at Parksville Canada Day 2011 parade.

At the Kulthkachoolth Music Festival in July 2011, a booth donated to the fire department was used to raise funds for the Tour de Rock, which sends pediatric cancer patients to Camp

Goodtimes. In September 2011, during the Tour de Rock fundraising cycle tour of Vancouver Island, the Coombs-Hilliers fire department will send its fire trucks to meet the charity riders at the Whisky Creek store, and will accompany the riders along the highway through the FPA.

Photo. Kulthkachoolth Music Festival, Coombs, July 2011.

Membership. The department, with a maximum capacity for 35 volunteer fire fighters, normally functions with a member compliment between 27 and 35. In July 2011 there were 22 members on the roster. Six new recruits, ranging in age from 16 to 30 years, joined in the spring of 2011. In 2010 there were 5 females, ranging in age from 18 to 32. The age range of members can span over 50 years; in 2009 the youngest member was 16, while the oldest member (a retired fire chief) was 70. A captain on the department was born and raised in the area.

While the member component has been relatively stable in recent years, a fire department spokesperson said it would be "nice to have a few more members". As a small fire department, it can be a problem to get "15 on callout" during the daytime. On some daytime calls, it is not uncommon to muster only 2 members.

Like other volunteer fire departments across Vancouver Island and the Gulf Islands, the Coombs-Hilliers department struggles to maintain numbers, both on its firefighting roster, and on its board of directors. Noted a fire department spokesperson, "Volunteering is getting harder".

A former chief of the Coombs-Hilliers Volunteer Fire Department remarked, "we're not full-time, we're not even part-time; there isn't enough time. Pre-planning is vital." And like many volunteer fire departments on southern Vancouver Island, the current fire chief at Coombs-Hilliers muses, "We've been lucky so far…we haven't had a major interface fire – not yet … but we're due…"

4.0 BIOPHYSICAL DESCRIPTION

4.1 Climate

British Columbia's Biogeoclimatic Ecosystem Classification (BEC) is a system that combines climate, vegetation, and site to classify the province's landscape into large geographic areas with broadly homogenous macroclimate. Biogeoclimatic zones are indicative of long-term climate conditions and disturbance regimes. Fourteen different zones are recognized in BC. These zones, in turn, may be subdivided further into subzones and types.

The northern half of the Coombs-Hilliers area is classified in the moist maritime Coastal Douglas-fir (CDFmm) biogeoclimatic subzone. Located in the rainshadow of the Vancouver Island mountains, the CDFmm biogeoclimatic subzone is primarily restricted to low elevations along southeast Vancouver Island and the southern Gulf Islands. The CDFmm has warm, dry summers, and mild, wet winters (mean annual precipitation averages approximately 870 mm). Growing seasons are very long, and feature pronounced water deficits on zonal (average) and drier sites. Long periods of droughts are not uncommon during the fire season (April to October). The CDFmm represents the mildest climate in Canada.

The southern half of the Coombs-Hilliers area is classified in the very dry maritime Coastal Western Hemlock (CWHxm) subzone. Similar to the CDFmm, the CWHxm occurs at lower elevations along the east side of Vancouver Island. The CWHxm has warm, dry summers and moist mild winters with relatively little snowfall (mean annual precipitation averages approximately 1570 mm). Like the CDFmm, growing seasons are long, and feature water deficits on zonal sites.

Photo. Summer at Little Qualicum Falls Provincial Park.

Prevailing weather systems in summer at Coombs-Hilliers can vary from moderately moist to windy and excessively dry patterns. Prevailing summer winds are southeasterly. Net radiation values are generally high.

"Crossovers" occur during the summer fire season, when the humidity falls below the value of a rapidly rising temperature. Crossovers can be particularly hazardous during windy conditions.

4.2 Physiographic Features

Landforms influence fire behavior by affecting ignition potential and the rate of fire spread.

The Coombs-Hilliers area is located in the Eastern Vancouver Island Ecoregion of the Georgia Depression Ecoprovince. The Eastern Vancouver Island Ecoregion, an area of reduced rainfall leeward of the Vancouver Island Ranges, is divided into two Ecosections corresponding to physiographic differences. The Coombs-Hilliers FPA falls largely within the Nanaimo Lowland Ecosection, a coastal plain that extends along the southeastern margin of Vancouver Island. The Nanaimo Lowland Ecosection developed in prehistoric times when ancient rivers and seas deposited marine, fluvial, and fluvioglacial deposits on the landscape.

Average elevational limits of the Nanaimo Lowland Ecosection range from sea level to approximately 200 m. Elevational range at Coombs-Hilliers is from approximately 80 m asl (above sea level) to 200 m asl (base of foothills of Vancouver Island Ranges). The Nanaimo Lowland Ecosection, including the Coombs-Hilliers area, typically has gentle to moderate slopes, although localised variations occur.

Photo. Gently rolling to undulating terrain is characteristic of Coombs-Hilliers.

Soils in the Coombs-Hilliers area developed predominately in shallow to deep, sandy gravelly fluvial, fluvioglacial and/or marine deposits. Drainage is usually rapid, although impeded drainage is found in localized areas. A strongly cemented pan is often present. A range of humus forms is present.

4.3 Vegetation

Human activities – logging, agriculture, natural resource extraction, and commercial and residential development – over the last century have significantly altered the natural landscape of the Nanaimo Lowland Ecosection, including that of the Coombs-Hilliers area.

Vegetation at the Coombs-Hilliers area is largely comprised of intact or fragmented coniferous forest stands. Most of these stands are second-growth; some third-growth plantations are present; little old-growth timber remains. Recent slash (newly logged areas at privately managed forest lands and real estate developments) also exist. Coniferous forests in the area are dominated by Douglas-fir, with lesser amounts of western redcedar, grand fir, and localized pockets of lodgepole pine (on well-drained sandy soils).

Mixed coniferous/deciduous stands are found at moist sites and riparian areas (i.e., portions of Dudley Swamp, Hamilton Marsh). Mixed forests contain a deciduous component of red alder and/or bigleaf maple, together with other deciduous trees and shrubs.

Photo. Young Douglas-fir forest with salal understorey layer at Coombs-Hilliers.

The understorey layer of many coniferous forests at Coombs-Hilliers is variably composed of salal, dull Oregon-grape, ocean-spray, red huckleberry, sword fern, bracken fern, and mosses such as Oregon beaked moss (*Kindbergia oregana*) and step-up moss (*Hylocomium splendens*). Less prominent species may include baldhip rose, snowberry, western trumpet honeysuckle, vanilla-leaf, electrified cat's tail moss (*Rhytidiadelphus triquetrus*), and various members of the lily family.

Vegetative cover at many farms in the area is dominated by cultivated fields (grass).

The federal/provincial Sensitive Ecosystem Inventory (SEI) has identified and mapped remnant sensitive ecosystems (less commonly represented and/or rarer ecosystems) on eastern Vancouver

Island. These less common and/or rare ecosystems, including sparsely vegetated ecosystems, terrestrial herbaceous ecosystems, wetlands, riparian ecosystems, woodlands, older forest, older second-growth forest, and seasonally flooded agricultural lands are represented at Coombs-Hilliers.

Management of interface areas should include strategies to protect sensitive ecosystems (i.e., Hamilton Marsh).

Photo. Hamilton Marsh

4.4 Natural Disturbance History

Prior to settlement by European immigrants in the late 1800's, the natural disturbance regime of forests in many areas of Vancouver Island consisted of infrequent stand-initiating events. Wildfires were generally of moderate size, and often included unburned areas resulting from sheltering terrain features or higher site moisture. Larger fires tended to occur after periods of extended drought. The landscape was dominated by extensive areas of mature forest surrounding patches of younger forest. The mean return interval for natural disturbances caused by wildfire ranged between 100 and 300 years (FPC Biodiversity Guidebook. 1995. MoFR).

Lightning sparked the majority of historical fires. First Nations peoples used prescribed burns to cultivate plants for food, medicine, and other uses.

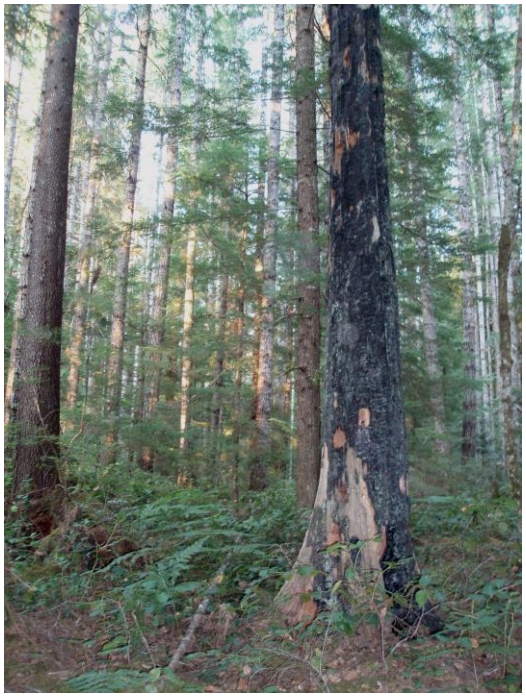


Photo. Fire-scarred Douglas-fir tree and surrounding second-growth forest near Hamilton Marsh.

Table 1. Mean forest fire return interval and fire size

Biogeoclimatic Unit	Mean Historical Wildfire Fire Return Interval (Years)			Fire Size (ha)		
	Minimum	Average	Maximum	Minimum	Average	Maximum
CDFmm	50-100	100-300	300-400	0.1-5	5-50	150-550
CWHxm	100-150	150-300	350-500	0-0.5	50-500	>500

(BC Wildfire Management Branch)

Infrequent, historical fires reduced natural fuel loading and recycled nutrients. Over the last century, the demise of traditional aboriginal cultural land management practices, combined with modern fire suppression has increased fuel loading (available combustible vegetation).

4.5 Recent Fire History

The Wildfire Management Branch maintains a database of wildfires that have occurred in the last fifty years (WMB, Coastal Fire Centre, 2011). Both human-caused and lightning-caused fires are recorded. British Columbia annually records a fairly equal split of lightning-caused and human-caused fires. In BC's southwest region, more than 90% of wildland fires are human-caused. Lightening typically accounts for very few wildfires on Vancouver Island. In 2010 the Coastal Fire Zone reported 584 wildfires; almost 98% of the wildfires on Vancouver Island were human-caused. In recent years, one out of every eight reported wildfires on the island was classified as an interface fire (WMB Coastal Fire Centre, 2010).

The Ministry of Forests and Range Protection Branch has ranked biogeoclimatic zones according to macroclimate conditions and fire regimes that will influence a wildfire. The ranking was based on the number of fires over 4 ha over the past 10 years per million hectares in each biogeoclimatic zone (Rating Interface Wildfire Threats in British Columbia, MoFR, 2008). The weighted ranking assigns the lowest score to the CWH, and a slightly higher score to the CDF. In comparison with forest districts in the Cariboo and the Kootenays, the mid-island, including Coombs-Hilliers, with <10 fires > 4 ha/ha[6], is classified with a low level of historical fire occurrence.

It should be noted that the ranking provided by the MoFR is a simple representation of large fire occurrence. Fire fighting officials on Vancouver Island warn that even a small interface fire on the island could cause considerable damage.

The Coombs-Hilliers Fire Department provided a verbal account of recent calls to respond to interface and/or potentially interface fires:

- Whisky Creek FSR – 12-13 "kids" burning tires; also car fires
- Chalet Road – car fire over bank of Cameron Lake
- Cameron Lake resort – chimney fire
- Deliberately set brush fire on bank of Melrose Road – overlooking Inland Island Highway
- Sun King Road – 2 fires at woodlot
- Gray Road – kids deliberately set fire to bank overlooking highway
- Deliberately-caused fires on TimberWest lands
- Human-caused fires along the power lines
- Kids burning garbage in the trees
- Fire in sawdust piles at sawmill on Tralee Road
- Structure fire on Poplar Way
- Human-caused fire in car/house on Milo Road
- Small brush fire behind a house on Melon Road
- Careless roofers put torch down during a re-roofing of a residence in the Burbank area; fire got under soffit, ignited a bird nest, and spread to the roof
- Structure fire at residence on Eld Road in 2009
- 2 barn fires in nearby Errington
- Fire started by squatters on the railroad tracks

- Picnic table chopped up and ignited at provincial campground
- Fire escaped at a party spot at Clarke Road East
- 30 youths set a campfire on the train tracks
- Intentional car fires – stolen cars torched at gravel pits, dead end logging roads
- Brush fire near Chalet Road "swimming hole"
- Deliberately set small bush fire on Melrose Road June 2011 (extinguished by local fire dept; forestry attended)

The fire department must also contend with potential interface fires resulting from illegal burning on private property, unabated slash, stolen vehicles set on fire, marijuana "grow ops", junk in yards, irresponsible tenants of some rental units in parts of the FPA, some irresponsible campers, and "some pretty haywire remote residential pockets [that are] difficult to protect".

5.0 Preparation of the Community Wildfire Protection Plan

Preparation of the Community Wildfire Protection Plan for Coombs-Hilliers followed criteria outlined in FireSmart (*FireSmart: Protecting Your Community from Wildfire*, Partners in Protection, 2003).

STEP ONE: Plan Overview – Objectives and Goals

Objectives and goals of the Community Wildfire Protection Plan were reviewed with the Union of BC Municipalities, the Regional District of Nanaimo, the Coombs-Hilliers Volunteer Fire Department, and the Wildfire Management Branch.

STEP TWO: Data Acquisition and Information Sharing

Identification and acquisition of resource and community information is necessary in order to share perspectives, priorities, and objectives relevant to the planning process.

Emergency planning guides and community resources consulted included:

- FireSmart – Protecting Your Community from Wildfire www.partnersinprotection.ab./ca
- Firestorm 2003 Provincial Review www.2003.firestorm.gov.bc.ca
- Addressing the Interface Fire Hazard – A Case Study of the District of Langford (District of Langford, 2001)
- Water Supply for Public Fire Protection *(*Fire Underwriters Survey, 1999*)*
- S-100 (BC) Basic Fire Suppression and Safety (MoFR, 2004)
- National Fire Protection Association (NFPA) Standards (NFPA, Massachusetts, USA)
- Area "F" OCP (May 2007) www.rdn.bc.ca
- RDN Emergency Preparedness Planning www.rdn.bc.ca
- BC Wildfire Management Branch www.for.gov.bc.ca/Protect

Preparation of the Coombs-Hilliers CWPP also involved consultation with fire departments and local government at the neighbouring District of Errington, City of Parksville, and Town of Qualicum Beach.

STEP THREE: Hazard - Risk Assessment

Hazard-risk models used in this project included:

- Canadian Forest Fire Danger Rating System
- Community Interface Fire Hazard Assessment (FireSmart)
- Hazard-Impact-Risk-Vulnerability Assessment
- Interface Wildfire Threat Analysis

STEP FOUR: Hazard Mapping

Interface hazard mapping was developed to:

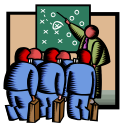
- identify areas at potential risk from wildland fire
- designate the community's wildfire interface zone

The Regional District of Nanaimo provided base mapping (topographic, cadastral, and ortho) for field work. Maps in the 1:5 000 and 1: 10 000 scale range were used as they provide the most detail, and allow for the most accurate mapping. Orthographic maps provided detail about the size and shape of forest polygons, and allowed for identification of structures. Cadastral data provided useful information about lot and property boundaries. Global information system (GIS) based mapping and modeling were used to spatially identify the severity of a wildfire hazard. Pre-mapping was refined with ground truthing. ArcGIS 9.2 software was used to convert field mapping to digital format (shape files) compatible with the provincial government's GIS system.

STEP FIVE: Community Hazard Reduction Priorities

Once the community assessment and base map were completed, local protection and hazard mitigation needs were analysed in consultation with the local fire department and local government.

STEP SIX: Action Plan to target the Interface Wildfire Threat



In consultation with the Coombs-Hilliers Volunteer Fire Department and the Regional District of Nanaimo, measures were developed to assist the community in addressing the wildfire threat.

STEP SEVEN: Education and Awareness

The process of developing a Community Wildfire Protection Plan can lead community members through valuable discussions regarding management options and implications. Effective public education and awareness will help motivate people to create FireSmart communities. The Coombs-Hilliers Volunteer Fire Department suggested several initiatives to raise awareness about the hazards of living, working, and recreating in the interface zone.

STEP EIGHT: Implementation

Community planning officials must mutually agree on fuel management priorities, equipment needs, requirements for additional local planning tools, and other necessary actions. The local government needs to establish an assessment strategy for the Community Wildfire Protection Plan to ensure the plan maintains its relevance and effectiveness over the long term.

6.0 Assessment

Hazard assessment methodology was based on standard fire danger and hazard assessment models:

1) Canadian Forest Fire Danger Rating System
2) Interface Community Fire Hazard Analysis
3) Hazard, Impact, Risk and Vulnerability (HIRV) Process
4) Interface Wildfire Threat Analysis

6.1 Canadian Forest Fire Danger Rating System

The Canadian Forest Fire Danger Rating System (CFFDRS), developed by Forest Canada, is a standard national system of rating fire danger. The computer-based CFFDRS is the primary fire management decision aid in Canada. During the fire season, BC's Wildfire Management Branch operates approximately 260 hourly weather stations throughout the province. Fire managers assess hourly weather observations, together with supplementary data from other agency stations, to determine fire danger on forestlands. Fire weather information is used to make fire prevention, preparedness and suppression decisions, and other general fire management decisions.

Photo. Fire weather station.

A general knowledge of the CFFDRS and its components is useful to understand fire danger and potential fire behavior.

The CFFDRS has two sub-systems:

1. **The Fire Weather Index (FWI) System**
2. **The Fire Behavior Prediction (FBP) System**

The **Fire Weather Index (FWI) System** uses four weather readings (taken each day at 1300 PDT). These inputs are:

- Temperature (wet and dry bulb)
- Relative Humidity
- Wind speed and direction
- Rainfall (cumulative – past 24 hours)

Weather readings are entered into standard tables which provide fire fighters with three Fuel Moisture Codes and three Fire Behavior Indices.

Fuel Moisture Codes. Fuel Moisture Codes are numerical ratings that express daily changes in moisture content of three classes or layers of forest fuel (each class has a different drying rate). Fuel Moisture Code values increase with lower fuel moistures.

Table. Fuel Moisture Codes

Fuel Moisture Code	Represents	Time Lag*	Amount of 24 hr rainfall required to lower value	Interpretation
FFMC Fine Fuel Moisture Code represents the moisture content in litter (needles, twigs) and other surface fuels	Surface Litter	2/3 day	0.6 mm	FFMC <77 – generally a fire will not start without concentrated effort 77-86 – app. 86% of ignition sources will start fires >86 – easy ignition of fuels >94 – almost 100% of ignition sources will ignite forest fuels
DMC Duff Moisture Code represents moisture content of duff layers 5-10 cm deep	5-10 cm duff	12 days	1.5 mm	DMC <35 – generally this layer will not be involved in fire activity >35 – this layer is involved as fire intensity increases
DC Drought Code represents the moisture content of deep duff layers 10-20 cm deep. The DC expresses seasonal drought effects on forest fuels and the amount of smoldering that will occur in deep duff layers and large logs	10-20 cm duff	52 days	2.9 mm	DC 0-300 – very little involvement of this fuel in most areas 300-450 – increased involvement with fires becoming more intense and mop-up problems increasing 500+ - extensive involvement of the fuel layer. Fires are intense with difficult mop-up problems, due to the depth of the fires

*Time lag = time required for fuel to lose 2/3 of its moisture under standard drying conditions, i.e., 21^0 C and 45% RH

Fire Behavior Indices. FWI Fuel Moisture Codes plus wind are linked to form three Fire Behavior Indices:

Initial Spread Index (ISI) – represents the relative fire spread expected immediately after ignition

Build Up Index (BUI) – represents the total amount of fuel available for consumption – useful in determining mop-up requirements – used in calculating rate of spread

Fire Weather Index (FWI) – represents the potential fire intensity

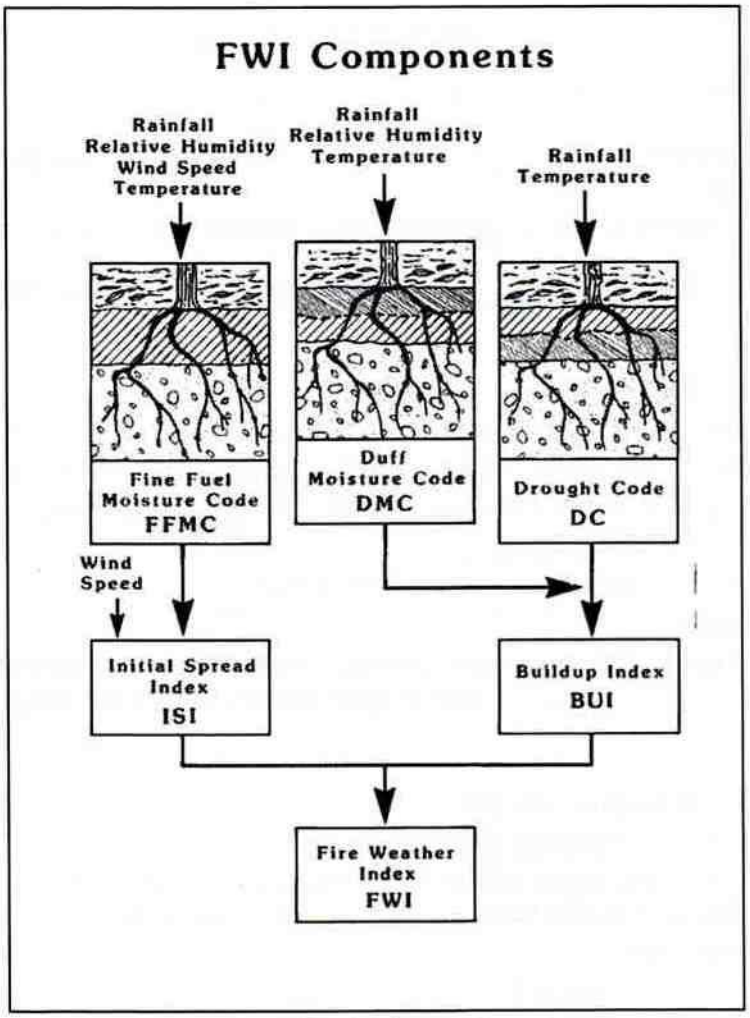


Fig. FWI Components

Fire Danger Class Ratings (DGR), calculated based on fire weather indices from a network of automated weather stations, are used to determine the need for open fire bans and public travel restrictions or road closures in forested areas. Industrial activities use the fire danger classes to determine restrictions on industrial operations, such as the need for early shutdown, "fire-watch" following early shutdown, or complete shutdown of industrial activity.

Table. Calculation of Fire Danger Classes

Build-up Index (BUI)	Fire Weather Index (FWI)				
	0	*1-7*	*8-16*	*17-30*	*31+*
0-19	I	II	II	III	III
20-42	II	II	III	III	IV
43-69	II	III	III	IV	IV
70-118	II	III	IV	IV	V
119+	III	III	IV	V	V

FWI = Fire Weather Index; BUI = Buildup Index

Fire Danger Class	**I**	**Very Low**
Fire Danger Class	**2**	**Low**
Fire Danger Class	**3**	**Moderate**
Fire Danger Class	**4**	**High**
Fire Danger Class	**5**	**Extreme**

Table. Fire Danger Class Descriptions

Fire Danger Class Rating	**Description**
Class 1	Forest fire is not likely to start. (**VERY LOW**)
Class 2	Forest fire danger is **LOW.** It is possible for fires to start in light flashy fuels, but they will have a slow rate of spread.
Class 3	Fire danger is **MODERATE**. Fine fuels in open areas and sunny slopes may spread rapidly. Use caution during any forest activities.
Class 4	Fire danger is **HIGH**. Fires will start easily from all causes, and will spread rapidly, and increase in intensity - they will be hard to extinguish. Spot fires may occur and will burn deep. Extreme caution must be used in any forest activities. Burning permits and industrial activities may be restricted.
Class 5	Forest fire danger is **EXTREME**. Small fires will spread very rapidly - they will be hard to extinguish. Severe spotting may occur. Mop-up will require a great deal of effort. General forest activities may be restricted, including burning permits, industrial permits, and campfires.

Fire behavior predicts how forest fuels will burn under different conditions. Forest fuels are typically classified according to the layer of the forest in which they are burning: ground, surface, or crown:

- Ground fires creep through the duff (organic soil) and decaying woody material beneath the forest floor. Ground fires often smolder for a long time, and are persistent, slow burning, and difficult to detect.

- Surface fires burn needles, cones, twigs, branches, logs, stumps, and leaves on the forest floor, in addition to lower branches of standing timber.

  Surface fuels include "ladder fuels" (aerial fuels) – i.e., branches, leaves, and bark on tall bushes; the lower branches of trees; or young understorey trees – which help ground and surface fires spread upward through the forest canopy into the tree crowns. Surface fires spread more rapidly by wind.

- Crown fires burn in the upper foliage and branches, and also consume surface and ground fuels. Crown fires occur when high-intensity surface fire spreads ("ladders") through the lower foliage into the canopy above. Crown fires spread from tree to tree.

  Crown fires travel quickly, are difficult to control, and are the most destructive fires.

Fuel Loading. Surface and ladder fuels were measured using a variety of approaches. Surface fuel assessment was done by placing a 30 cm2 grid at the heaviest accumulation of fine fuels (woody debris $\leq$ 7.5 cm in diameter) within the plot. The grid was then placed in at three cardinal directions measured from the initial grid location within the plot. Qualitative assessment of fine fuels was averaged for the plot. A ranking of low, moderate, or high surface fuel loading was ascribed to the plot. Relative percentage of 1 hour (0 to 0.6 cm diameter), 10 hour (0.6 to 2.5 cm diameter), and 100 hour fuels (2.5 to 7.5 cm diameter) fuels was visually estimated at each plot ("hours" relates to fuel size and how quickly the fuel in each category dries out). Samples of surface fuels were collected and weighed, oven-dried at 105^{0} C for 24 hours, and weighed after oven-drying to obtain air-dry weights.

Ladder fuels were assessed by measuring vertical and horizontal distribution of ground and surface fuels, including height of fuels from ground, and height to base of live (and/or dead) crown.

Measurements of biomass fuel loading were made at selected points. Representative samples were chosen at points with low, moderate, and high surface fuel loading. Crown fuel loading was estimated using a Canadian Forest Service Northern Forestry Centre spreadsheet program. Total stem loading was estimated using Biopak, a computer data base for stem mass based on regression equations (Oregon State University Forest Science Data Bank). Total Biomass was calculated based on Crown Fuel Loading.

Fire Behavior Prediction Forest Fuel Types and Fuel Type Descriptions. The Canadian Forest Fire Behavior Prediction System (FBP) models the rate of spread, fuel consumption, fire intensity, and fire growth for benchmark fuel types. Detailed descriptions of the FBP System fuel types can be found in Forestry Canada Information Report ST-X3, Development and Structure of the Canadian Forest Fire Behavior Prediction System (Forestry Canada Fire Danger Group, 1992).

The Fire Behavior System employs five generic fuel type classes, subdivided into sixteen benchmark fuel types, to forecast how a wildfire will react. A vegetative fuel type is defined as an identifiable association of fuel elements of distinctive species, form, size, arrangement, and continuity that will exhibit characteristic fire behavior under defined burning conditions. Classification of fuel types incorporates stand structure and composition, surface and ladder fuels, and the forest floor cover and organic (duff) layer.

Major fuel type classes are:

- Coniferous stands
- Deciduous stands
- Mixedwood stands
- Slash
- Open (grass)

Fuel types are described qualitatively, rather than quantitatively, according to characteristics of forest stands. Fuel types are generic; they represent a type of behavior pattern, rather than the specific type of stand found in an area.

Fire behavior also describes the way in which fuel ignites, flame develops, and fire spreads. A wildfire behaves according the environment in which it is burning. Fire behavior is affected by three elements of the fire environment – fuel, weather, and topography.

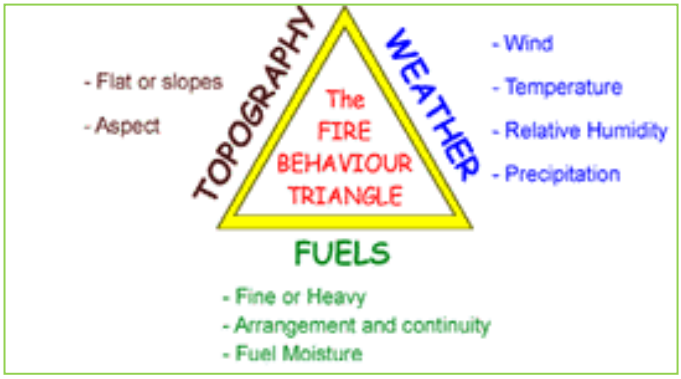


Figure. Fire Behavior Triangle

A change in any of the components of the fire environment will cause a change in the behavior of the fire – the change can be very abrupt and rapid. Of the elements affecting fire behavior, only fuel can be managed.

Table. Fire Behavior Triangle Components

Weather	Wind Temperature Relative Humidity Precipitation	Wind can push a fire forward; fires also create their own wind currents. Heat results naturally (lightning strike) or is introduced by people. Low relative humidity can dry out fuels, causing them to ignite more easily. Precipitation can put out a fire; conversely, a lack of precipitation dries fuels, increasing the fire threat.
Topography	Flat or Slopes Aspect	A fire moves more rapidly up hills. A fire is more likely on drier southern and western aspects.
Fuels	Light or Heavy Arrangement Fuel Moisture	The drier and lighter the fuels, the more easily they will ignite. A continuous layer of fuels on the forest floor aids the spread of a fire. Low fuel moisture can promote chance of ignition and increase fire spread.

Adapted from U. S. Dept. of Agriculture – Forest Service

Fire weather, fuel types and topography are combined to predict three output fire behavior factors:

1. Fire Intensity – a measure of the rate of heat energy released – based on the rate of spread and predicted fuel consumption.

2. Rate of Spread – measure of the speed at which a fire extends horizontally – based on the hourly Initial Spread Index (ISI) value, and adjusted for steepness of slope.

3. Crown Fraction Burned – measure of the proportion of tree crown involved in a fire – based on the rate of spread, crown base height, and foliar moisture content.

Based on fire behavior, severity of wildfire hazard is measured using:

a. Risk of ignition
b. Structures at risk
c. Suppression constraints

Risk of Ignition. Risk of ignition at Coombs-Hilliers is primarily from human activity. Common human-caused ignition sources include: discarded cigarettes and matches from smoking, campfires, motorised machinery, motorised recreational vehicles (i.e., dirt bikes), and fires started at homes, businesses, and yards adjacent to woodland areas.

Table. Risk of ignition

Location	Probability of Ignition
Areas within 20 m of any roads and trails	Moderate to High
Areas within 20 m of power lines	High
Areas within 100 m of housing/ industry/ commercial	High
Areas frequented by party goers	High

Structures at Risk. Structures at risk include all human-made structures (buildings and facilities) that have the potential to be destroyed or damaged by wildfire.

The range of structure types found at Coombs-Hilliers include old and new residential construction - mobile homes and smaller rental units, and large new homes on expansive acreages; a variety of commercial and light industrial operations; different types of tourist facilities; and a small number of older and newer institution-type buildings (meeting halls and small, private elementary schools).

Table. Structures at Risk		
Unnatural Fuel Types- Structures at Risk (human structures and facilities)	-Construction materials of local structures in high risk interface areas vary from highly combustible (i.e., cedar shake roofing; wood siding) to fire-retardant (metal roofs, cementitious siding materials). -Some chimneys do not have spark arrestors.	In interface areas, safety of buildings should be a high priority.
Effect on fire behavior:	-Difficult-to-access structures with inadequate fireflow have highest risk. -Poorly accessed structures constructed with combustible materials (combustible roof-covering assemblies and non fire-resistant siding) surrounded by forest coniferous cover present very high risk.	During "crossover" events (low humidity/high temperatures) structural fires can readily spread to adjacent wildland vegetation.

Suppression Constraints. Suppression constraints are rated based on:

- suppression resources and capabilities
- access restrictions
- topographical features

Suppression response to most areas of Coombs-Hilliers is 8-10 minutes. Response time to Chalet Road area of Cameron Lake is longer. Response times of the volunteer fire department may vary, depending on time of day and season. Only one area of the FPA has hydrants (Whisky Creek); these are outdated. Water for fireflow must be hauled to all areas of the FPA.

The fire department operates under mutual aid. Local fire resources would be overwhelmed by large/long or multiple calls.

Table. Suppression Constraints		
Factor	**Specifics**	**Rating**
Distance from roads	0-50 m from a road 50-100 m from a road >100 m from a road >300 m from a road	Low Moderate High Extreme
Gradient of roads	All-weather road surface (i.e., paved): <20% ≥20% Gravel <15% ≥15%	 Low Moderate-High Low-Moderate High-Extreme
Availability of water sources	Areas < 300 m from a fire hydrant Areas > 300 m from a fire hydrant *Water for fireflow must be hauled to all areas of the FPA.	Low (if hydrants in good working order) High
Distance from a fire hall	Areas < 8 km from a fire station Areas > 8 km from a fire station	Low High - Extreme

Photo. Interface fire (FireSmart, 2003).

Fire Intensity Ranking. The Fire Intensity Rank System summarises fire behavior (MoFR, Wildland Fire Branch).

Rank 1 - smoldering ground or creeping surface fire.

A Rank 1 fire is a smoldering ground fire or a fire that burns in the ground fuel layer. These fires have no open flame and produce white smoke.

Firebrands and going fires tend to be virtually self-extinguishing unless high Drought Code and/or Build up Index values prevail, in which case extensive mop-up is generally required.

Rank 2 - low vigour surface fire.

A Rank 2 fire has a rate of spread of less than 1.5m/min.

A Rank 2 fire is a surface fire or a fire that burns in the surface fuel layer, excluding the crowns of trees. Rank 2 fires produce visible open flame; have little or no spread, which is the speed at which the fire extends; and have an unorganized flame front or a flame front that does not exhibit all the same characteristics.

Suppression is achieved through direct manual attack at the fire's head or flanks by fire fighters with hand tools and water. A constructed fire guard should hold.

Rank 3 - moderately vigorous surface fire.

Rate of spread: 1.5 - 3.0 m/min.

A Rank 3 fire is a vigorous surface fire with a moderate rate of spread. A Rank 3 fire has an organized front and may display "candling" (tree's fuels ignite and flare up along the perimeter and/or within the fire).

Hand-constructed fire guards are likely to be challenged. Successful control of Rank 3 fires generally involves heavy equipment (bulldozers, pumpers, retardant aircraft, skimmers, helicopter w/bucket).

Rank 4 - highly vigorous surface fire, torching (or passive crown fire).

Rate of spread: 3.0 - 6.0 m/min.

A Rank 4 fire produces grey to black smoke, has an organized surface flame front, and has a moderate to fast rate of spread along the ground. Short aerial bursts and short range spotting will occur with these fires.

Control efforts at fire's head may fail.

Photo. Rank 4 fire.

Rank 5 - Extremely vigorous surface fire or active crown fire.

Rate of spread: 6.0 - 18.0 m/min.)

A Rank 5 fire produces black to copper smoke, has an organized crown fire front, moderate to long-range spotting and independent spot fire growth.

Very difficult to control. Suppression action must be restricted to fire's flanks. Indirect attack with aerial ignition (i.e., helitorch and/or aid dispenser) may be effective.

Rank 6 – Blow-up or conflagration, extreme fire behavior.

Rate of spread in excess of 18.0 m/min.

Violent fire behavior occurs with a Rank 6 fire. An organized crown fire front, moderate to long-range spotting and independent spot fire growth are characteristic of this fire type. There may be the presence of fireballs and whirls.

Violent physical behavior is probable. Suppression actions should not be attempted until burning conditions ameliorate.

Photo. Rank 6 fire.

6.2 Interface Community Fire Hazard Analysis

The Ministry of Forests and Range Protection Branch "Interface Community Fire Hazard" analysis provides a quantitative procedure for assessing the interface fire hazard. Based on FireSmart, the analysis ranks over 23 factors (including an assessment of fuel type characteristics, response time, accessibility, etc.) and assigns points – the greater the hazard, the greater the number of points – to each hazard-risk factor. An interface area, site, or structure is not considered to be "fire safe" unless it obtains a low or moderate assessment score.

Fire hazard = likelihood of fire starting + values at risk + types of fuels surrounding the area + fuels and topography.

Fire hazard is very site specific, and correlates strongly with fuel evaluations, risk of ignition, and FireSmarting. Communities undertaking fuel management work use fire hazard assessments to identify where they should prioritize and focus their work.

Assessment of fire hazard always includes an analysis of local weather data.

Photo. Wildfire Management Branch sign on Highway 4 at Coombs-Hilliers FPA.

6.3 Hazard, Impact, Risk and Vulnerability (HIRV) Process

Risk assessments allow communities to anticipate and reduce the impacts of natural and manmade hazards by analyzing current and historical data and information resources. The HIRV model is a useful planning tool for local governments.

The HIRV process consists of:

- Hazard Identification
- Risk Analysis
- Vulnerability Assessment
- Impact Analysis
- Risk Management

Hazard can be loosely thought of as the product of risk, vulnerability, exposure, and the capacity of humans to respond to extreme conditions. For the purposes of this report, hazard refers to an unplanned or unwanted natural or human-caused fire, or a prescribed fire that threatens to escape.

Risk is a measure of the probability of occurrence of an event and the expected severity, and an analysis of potential factors (human or natural) which can contribute to the potential for fire occurrence.

Risk should not be confused with risk of ignition. For the purposes of this report, the probability of ignition can be accounted for by assigning a higher hazard rating to areas where fires are most likely to be started.

Vulnerability defines the ability of people, property, industry, resources, and areas of environmental and historic concern to weather, resist, or recover from the impacts of a hazard in the long term as well as the short term.

Impact is assessed through an analysis of social, environmental, economic, and political factors. Impact analysis provides the necessary links between vulnerabilities and hazards.

6.4 Interface Wildfire Threat Rating

Interface hazard mapping at Coombs-Hilliers used the recognized Ministry of Forests and Range WUI Wildfire Threat Rating System. The system has five hazard classes: Very Low, Low, Moderate, High, and Extreme. Determination of the threat rating used fire behavior modeling to evaluate the ability of forestland surrounding and abutting structures to support a wildfire.

Determination of the interface wildfire threat incorporated sample plots in different fuel types across the Coombs-Hilliers FPA (Appendix 1). Biophysical, mensurational, and silvicultural, and interface (type and proximity of structures in the area) characteristics of these fuel plots were assessed and correlated. Critical risk factors, including fuel, weather, topography, and position on the development on the landscape were incorporated into the description of the fuel plots. The information was converted into spatial data to rate the severity of wildfire hazard at different areas of the Coombs-Hilliers Fire Protection Area.

MoFR Wildland Interface Wildfire Threat Rating Classes

VERY LOW *(Blue)* **–** Water bodies that do not have any forest fuels. These areas are not a wildfire threat.

Examples: lakes and ponds

LOW *(Green)* **–** Developed and undeveloped land that will not support significant wildfire spread; cleared and/or built-up areas on gentle to moderate terrain with no readily combustible vegetation. Fire protected areas with fast response times; low risk to adjacent development.

Examples: built-up urban and suburban areas and farm areas with modified forest fuels

MODERATE *(Yellow)* **–** developed and undeveloped land that will support surface fires only. Homes and structures can be threatened. These areas may have partially modified forest fuels/ scattered mixed forest in suburban areas/ moderate to good water availability/ good fire protection coverage with adequate response times/ periodic fire starts/ gentle to sloping topography.

Examples: Moderately build-up suburban areas with dispersed fuel types. Unmanaged fields with tall grass, shrubs, and a deciduous tree canopy. Grass fields with coniferous shrubs and tree overstorey below 20% canopy coverage. Some patches of isolated coniferous stands less than 1 ha in size.

HIGH *(Orange)* **-** areas with little or no fuel modification; continuous ground fuels; sloping terrain with/without gullies present; moderate to low availability of water; delayed fire protection coverage, or no fire protection; some areas hard to access; direct threat to homes/structures/values

Examples: Forested land with coniferous coverage exceeding approximately 40% canopy closure. Development on steep, forested slopes. Dispersed rural development in the midst of coniferous forest. Coniferous forests with high surface and ladder fuels surrounding development in remote areas.

EXTREME *(Red)* **-** areas with little or no fuel modification; continuous ground fuels; rolling and gullied terrain; rock outcrops may be present; low water availability; often outside fire protection boundaries; some inaccessible terrain; may or may not have heavy use (recreation/resource industry); often has history of frequent fire starts; direct threat to homes/structures/values

Examples: Forested land with relatively continuous coniferous canopy closure, in excess of 40%, down slope from homes and other development. Steep, gullied slopes with a continuous forest cover above homes.
Direct impact can be considered within 300 m of development. Continuous forested areas with recreational and industrial use >300 m from development also have an impact on potential wildfire.

MoFR and WMB

Fire behavior factors for wildfire threat classes are summarized as follows:

Table. General Characteristics of Areas with Very Low Interface Wildfire Threat

Fire Behavior Factors	Ratings
Fire Behavior	Low Fire Intensity – N/A Rate of Spread – N/A (water body)
Risk of Ignition	Very Low – N/A
Structures at Risk	Very Low
Suppression Constraints	Very Low
Comments	Very Low concern – unless small water body dries out in summer

Table. General Characteristics of Areas with Low Interface Wildfire Threat

Fire Behavior Factors	Ratings
Fire Behavior	Low Fire Intensity – low Rate of Spread – slow (flat to gentle topography)
Risk of Ignition	Low – limited ignition sources
Structures at Risk	Low – developed areas have high degree of modified natural fuels
Suppression Constraints	Low – good access, with good fireflow; within close proximity to a fire hall
Comments	Low concern – built-up areas; modified fuels; good detection

Table. General Characteristics of Areas with Moderate Interface Wildfire Threat

Fire Behavior Factors	Ratings
Fire Behavior	Moderate Fire Intensity - low Rate of Spread – slow (flat to gentle slopes) Crown Fraction Burned - low
Risk of Ignition	Moderate – bylaws in place to prevent fire season fires; good detection
Structures at risk	Moderate – moderately fire-resistant construction with varying degrees of natural fuel loading. Modified natural fuels.
Suppression Constraints	Low to Moderate – adequate fireflow (hydrants) with good pressure and volume generally available. Good access.
Comments	Moderate concern – Property owners, visitors to these areas need to be aware of potential fires in the interface

Table. General Characteristics of Areas with High Interface Wildfire Threat

Fire Behavior Factors	Ratings
Fire Behaviour	High Fire Intensity – high Rate of Spread – rapid (especially if fanned by wind) Crown Fraction Burned – moderate to high
Risk of Ignition	High – close proximity to extensive continuous forest fuel complexes
Structures at Risk	High – structures located within or adjacent to areas with high fuel loading
Suppression Constraints	Low to High – Fire suppression capabilities reasonable along fringes of forested areas, to poor (no fireflow or access) in interior of forested areas
Comments	High hazard areas include both intermix and interface

Table. General Characteristics of Areas with Extreme WUI Wildfire Threat

Fire Behavior Factors	Ratings
Fire Behavior	Extreme Fire Intensity – high to extreme Rate of Spread – very rapid (wind and slopes will increase rate of spread) Crown Fraction Burned – high to extreme
Risk of Ignition	Extreme – spike in summer recreation activities increases risk of ignition in areas with forest and brush (i.e., cigarettes, campfires) - land clearing and recreational activities contribute to risk of ignition
Structures at Risk	High to Extreme –structures with combustible roofing/siding surrounded by combustible vegetation present the highest risk
Suppression Constraints	High to Extreme – Inadequate fireflow, or no fireflow will necessitate long hose pulls, or aerial suppression
Comments	Hard-to-access interior/peripheral areas with high fuel loading and delayed response times; multiple values at risk.

Wildfire threat ratings should encourage local governments to analyse and explore the implications of different activities in relation to wildfire risk.

7.0 Assessment Results

As noted in Section 6, a complex range of factors influence fire behavior. Fire behavior modeling was used to evaluate the ability of forestland surrounding and abutting structures in the Coombs-Hilliers area to support a wildfire. A combination of critical risk factors, including fuel, weather, topography, and position on the development on the landscape were quantified and converted to spatial data delineating the severity of wildfire hazard at the Coombs-Hilliers Fire Protection Area.

Determination of the wildfire threat employed a series of sample plots established throughout the FPA. Fuel types, vegetation structural stages, and fire behavior characteristics of these sample points, together with photo locations, are listed in Appendices 1, 2 and 4. Coniferous fuel types, which represent the most common and widespread fuel types at Coombs-Hilliers, generally present the highest risk with respect to potential fire behavior. Other fuel types also present concerns. For example, the fire department is often called to respond to grass fires along highway rights-of-way. Fire behavior characteristics and output factors for generic fuel types at Coombs-Hilliers are summarized below.

FIRE BEHAVIOR CHARACTERISTICS, OUTPUTS FACTORS - GENERIC FUEL TYPES, COOMBS-HILLIERS
(BASED ON WEATHER CONDITION PREDICTIONS FOR 90TH PERCENTILE FW INDICES)

OUTPUT FACTORS→ FUEL TYPES↓	FIRE INTENSITY (BASED ON RATE OF SPREAD AND PREDICTED FUEL CONSUMPTION)	RATE OF SPREAD (SPEED OF FIRE – ADJUSTED FOR STEEPNESS OF SLOPE AND WIND)	CROWN FRACTION BURNED (PROPORTION OF TREE CROWNS INVOLVED IN FIRE)
CONIFEROUS STANDS	MODERATE TO HIGH OR EXTREME	MODERATE TO RAPID	**HIGH**
MIXED WOOD STANDS	LOW TO MODERATE	MODERATE	**LOW TO MODERATE**
DECIDUOUS STANDS	LOW	LOW	**LOW**
SLASH AND DOWNED WOODY DEBRIS	MODERATE TO HIGH	MODERATE TO RAPID	**N/A**
GRASS-DOMINATED	LOW TO HIGH	LOW TO HIGH (DEPENDING ON SEASON, DRYING OF FUEL, SLOPE)	**N/A**

Examples of surface and crown fuel loading data are summarized below to highlight the range of fuel loading. Lands with public ownership (eg., parklands) interfacing development provide good candidates for UBCM's Strategic Wildfire Prevention Program, whereby local governments are eligible for provincial funding to reduce the threat of wildfire to communities. Potential candidates for fuel management at Coombs-Hilliers are the precincts of Hamilton Marsh, new parkland dedication south of Whisky Creek Store, and a number of small community parks and trails interfacing pockets of rural residential development.

Table. Surface Fuel Loading - Selected Sample Points at Coombs-Hilliers.

Location	Easting	Northing	Aspect/ Slope	CFFDRS Fuel Type	Crown Fuel Loading* kg/m2	Surface Fuel Loading** kg/m2
Little Qualicum Falls Provincial Park S fringe	387,772.78	5,463,177.21	Variable/ gentle - moderate	Coniferous Forest	M-H	M-H
Hamilton Marsh forest	393,878.65	5,463,788.14	Flat-variable/ gentle	Coniferous Forest	M-H	M-H
Milo Road area	392,078.06	5,462,138.38	Flat/ gentle	Coniferous Forest	M-H	M
Forest park S. of Whisky Creek	389,687.05	5,463,034.56	Variable/ moderate	Coniferous Forest	H	M-H
Kriscott Rd	388,979.86	5,462,333.47	Flat/ gentle	Coniferous Forest	M-H	M-H
Coombs Country Rodeo Campground area	395,120.17	5,462,281.34	Flat/ gentle	Coniferous Forest/ Grass	L-M	L
Eld Road	387,175.33	5,462,198.13	Variable-west/ Moderately steep	Coniferous Forest	M-H	M-H
Coombs Country Market parking area	396,647.93	5,462,281.34	Flat/ gentle	Coniferous Forest	M	L

* Crown Fuel Hazard Ratings: L < 0.5 kg/m2; M 0.5-1.0 kg/m2; H > 1.0 kg/m2

**Surface Fuel Hazard Ratings: L < 3 kg/m2; M 3-8 kg/m2; H >8 kg/m2

Assessments of total biomass and surface fuel loading at Coombs-Hilliers were compared with results from other forest fuel types on southeast Vancouver Island. Fuel loading tends to be highly variable. Combustible woody debris in the forest understorey (i.e., surface and ladder fuels) can pose a significant fire risk when homes, trails, and other structures and facilities are located next to, or in the midst of forested areas.

Vegetation management programs conducted through UBCM's Fuel Management Programs at various jurisdictions on Vancouver Island have effectively reduced ground and surface fuels in fuel-reduced buffer zones near key facilities, along recreation trails, and adjacent to residential areas. Fuel management is recommended at strategic public parklands and trails at Coombs-Hilliers as a means of reducing the threat of wildfire.

Photo. Fuel reduction, Cowichan Valley Trail, May 2011.

Photo. Fuel reduction treatment being implemented at Gowlland Todd Provincial Park, next to a rural subdivision.

Hazard, Impact, Risk and Vulnerability Modelling. Hazard-Impact-Risk-Vulnerability (HIRV) modeling was developed to assess the potential impact of interface fire at different locations at the Coombs-Hilliers area.

HIRV Tables: Selected Locations at Coombs-Hilliers

Hazard	Risk Rating	Certainty	Vulnerability Rating	Certainty	Impact Analysis*	Certainty	Risk and Vulnerability Analysis
Wildfire Hazard: Little Qualicum Falls Provincial Park	High	Data is well established	High-Extreme	Data is well established	**Env=3 Soc=2 Econ=2 Pol=3**	Data is well established	Risk= **High** Vulnerability= **High-Extreme**

Hazard	Risk Rating	Certainty	Vulnerability Rating	Certainty	Impact Analysis*	Certainty	Risk and Vulnerability Analysis
Wildfire Hazard: Coombs Country Rodeo Grounds	Mod-High	Data is well established	Mod-High	Data is well established	**Env=2 Soc=3 Econ=2 Pol=2**	Data is well established	Risk= **High** Vulnerability= **Mod-High**

Hazard	Risk Rating	Certainty	Vulnerability Rating	Certainty	Impact Analysis*	Certainty	Risk and Vulnerability Analysis
Wildfire Hazard: Hamilton Marsh area	Mod-High	Data is well established	Mod-High	Data is well established	**Env=3 Soc=2 Econ=1 Pol=3**	Data is well established	Risk= **Mod-High** Vulnerability= **Mod-High**

Hazard	Risk Rating	Certainty	Vulnerability Rating	Certainty	Impact Analysis*	Certainty	Risk and Vulnerability Analysis
Wildfire Hazard: Milo Road	Mod-High	Data is well established	Mod-High	Data is well established	**Env=2 Soc=3 Econ=1 Pol=1**	Data is well established	Risk= **Mod-High** Vulnerability= **Mod-High**

Hazard	Risk Rating	Certainty	Vulnerability Rating	Certainty	Impact Analysis*	Certainty	Risk and Vulnerability Analysis

***** Env=Environmental Soc=Social Econ=Economic Pol=Political Ratings: 1=Low, 2=Moderate, 3=High, 4=Extreme

Table. HIRV Interpretation

Impact	Examples	Rating
Social	-possible injuries -possible deaths -loss of housing -disruption of family life -critical facilities lost	**Low -** Minor disruption of society **Medium** - Possible injuries and small-scale disruption of family life **High -** Serious injuries; large-scale community disruption **Extreme -** Multiple fatalities; major disruption of community life and loss of critical facilities
Political	-coerced risks -catastrophic risks -unresponsive process -memorable events -industrial risks	**Low** - Minor opposition **Moderate** - low level of political backlash – intervention may be required **High** - significant event embroils government - major actions required **Extreme** - Significant intervention required from all levels of government In the event of a major catastrophe government declares "Disaster Area"
Environmental	-quality of life -water quality -destruction of natural resources	**Low** - Minimal environmental impact at area of effect **Moderate** - Regional environmental damage **High** - Long-term recovery. Requires significant after action **Extreme** - Severe long-term effects on biodiversity
Economic	-structural; non-structural damage -loss of services; jobs -loss of revenue	**Low** - Economic impact minimal **Moderate** - Loss of business **High** - Regional long term loss **Extreme** - Chronic long-term economic downturn

HIRV modeling indicates risk management (mitigation) is necessary in areas with a High to Extreme interface fire hazard rating. The majority of the Coombs-Hilliers FPA is rated with a high to extreme wildfire threat.

8.0 Interface Wildfire Threat Rankings

Approximately 97.5% of the Coombs-Hilliers FPA was assessed with a high to extreme hazard interface fire hazard rating.

Fire Hazard Rating at Coombs-Hilliers FPA

Fire Hazard Rating	Hectares	% of Coombs-Hilliers land base
Extreme	**244.48**	**4.39**
High	**5,190.57**	**93.15**
Moderate	**125.21**	**2.25**
Low	**9.68**	**1.17**
Very Low	**2.39**	**0.04**
Total:	**5,536.82***	100%

*N. B., total area not exactly same as FPA total area due to small incongruences in spatial data conversion

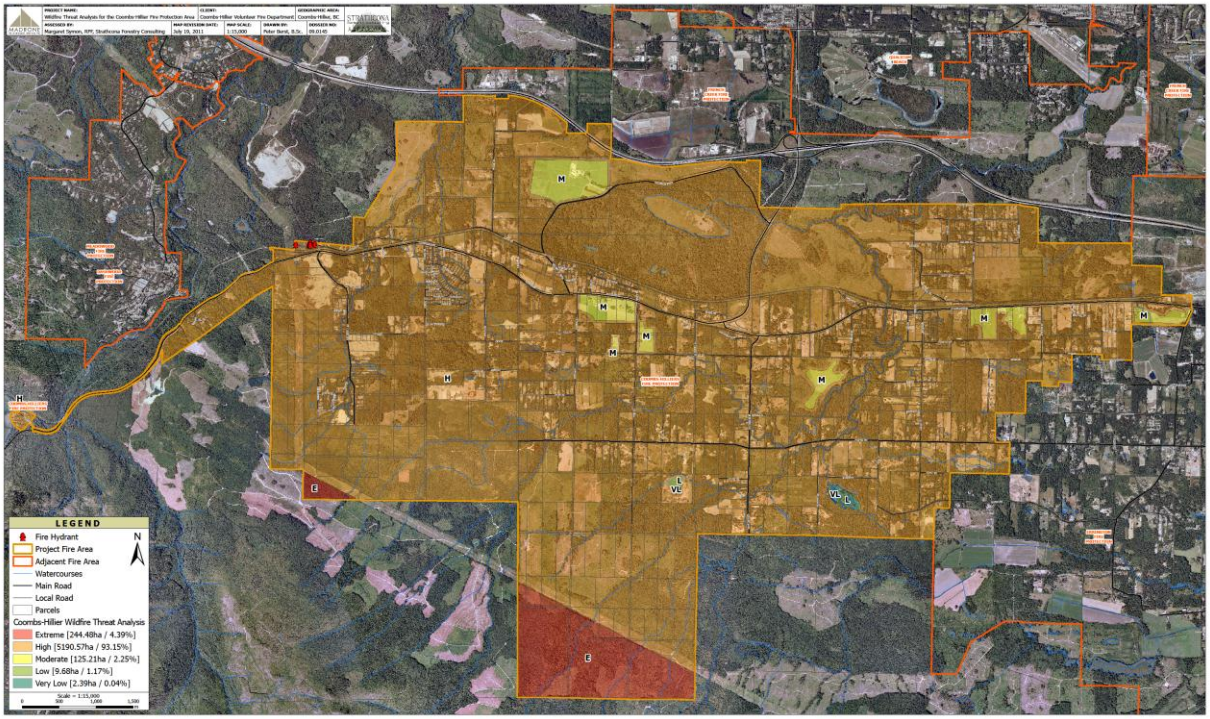


Figure. Interface Wildfire Threat Mapping, Coombs-Hilliers.
For large map, see Appendix 3.

9.0 DISCUSSION

Community values listed in the Official Community Plan for Area "F" help define current and future goals for land use at Coombs-Hilliers. These communities are committed to a rural green lifestyle sustained with a minimum of bylaws and government policy. Support for only a low level of regulations is inherent in local attitudes towards privacy and greenspace. One local resident commented that a lack of rules serves as an attraction for some people who want to "get away from it all". The challenge facing the fire department and local government is how to foster an awareness of the very real threat of interface fire. Almost 100% Coombs-Hilliers Fire Protection Area is rated with a high-extreme interface fire threat. Compared to many other volunteer fire departments on Vancouver Island, the Coombs-Hilliers department is called to respond to a disproportionately higher number of interface fires.

A range of interface management issues concerns the local fire department:

- Significantly high number of human-caused "wildfires"
- A high number of grassfires, often started by cigarettes in dried grass along the area's highways
- At present there are no "really effective" means of communicating fire prevention/fire protection strategies to the community
- Lack of community knowledge about local parks and trails
- Difficulty in obtaining tenure information and emergency contacts, harvesting activities (i.e., slashburning schedules), and access keys to privately managed forest lands within and adjacent to the FPA
- Amount of fuel loading around many areas of residential, commercial, and small-scale industrial development throughout the area
- Inadequate access for emergency vehicles: dead-end roads, incomplete road ends, steep roads, narrow driveways
- Hazards to firefighters at calls to respond to fires at marijuana "grow ops"; these hazards range from potentially substandard, unsafe building construction to concealed weapons and toxic substances
- Lack of street addresses at some areas
- Response challenges to some calls (particularly daytime)
- Brush along abandoned rail grade is not maintained; several fires have been started "along the tracks"
- Lack of bylaw enforcement
- Recruiting and maintaining fire fighters on the department roster is becoming increasingly difficult
- Maintaining sufficient volunteer members to serve on the fire department's society board
- Forest tenureship changes make it difficult to contact appropriate personnel and gain strategic access during an emergency
- "Junk" at some properties

As noted by a fire department spokesperson, the Coombs-Hilliers department is "not full-time, not even part-time…[there's] not enough time" to adequately address a growing spectrum of interface issues.

From the present standpoint of community fire protection, fires have the potential to develop into catastrophic wildfires of a scale and intensity beyond the range of historical variability (Agee, Fire Ecology of the Pacific Northwest. 1993). After the serious 2003 wildfires in BC's interior, the BC government estimated approximately 685,000 hectares of forested areas interfacing communities across the province is in need of fuel treatment to reduce the threat of wildfire (Wildland Fire Management Working Group).

Climate change, pests, disease, invasive species, shifting demographics, developments within the wildland interface, and public policy on land use and land management practices all have a major impact on wildland fire, and how it is managed. The WFMWG points out that in the last three decades, the complexity has increased as a result of many social, economic, political, and ecological factors – from conflicting demands on the resource base, to expanding population growth in the interface zone. Coombs-Hilliers is just one of many areas in the province facing complex interface issues.

10.0 COMMUNITY ACTION PLAN

Mitigative action to reduce the threat of fire in interface areas is largely a community responsibility. Local government, in concert with local and provincial fire officials, must take the lead in development and implementation of risk reduction strategies and policies to:

- Raise public awareness and preparedness
- Oversee risk assessment and mitigation techniques
- Commit to guidelines for land use and development
- Establish and maintain an integrated emergency response and management system

Effective public education and community involvement can encourage home, business, and property owners to take their own preventative measures in interface fire risk areas.

The following community action plan to reduce the risk of interface fire at Coombs-Hilliers was developed in consultation with the Regional District of Nanaimo, Coombs-Hilliers Volunteer Fire Department, and the Wildfire Management Branch.

Education and Community Involvement

1. Support efforts by the Coombs-Hilliers Volunteer Fire Department to raise awareness and educate local property owners and the visiting public about fire prevention in the interface zone.
   Residents and businesses in Coombs-Hilliers need to be aware that if their volunteer fire department receives multiple, simultaneous calls to respond to several structural fires in different locations, even with mutual aid from adjoining jurisdictions, response times of more than 10 minutes can generally result in extensive fire damage.

   "Communication is our biggest problem."
   Coombs-Hilliers VFD

2. Continue to promote FireSmart awareness on the Regional District of Nanaimo website.

3. Consider creation of a Coombs-Hilliers Volunteer Fire Department website (as part of the RDN fire services website) that could be used for recruitment, public awareness, and promotion of fire department activities.

4. Adopt the FireSmart (Partners in Protection, 2003) standard for community protection, both for public and private property.

5. Fire department attendance on the RDN fire services committee ensures ongoing liaison between local government and fire departments.

6. At the start of summer fire season, consider inserting a brief notice into local tax or services bills to advise local residents and businesses about fire prevention and fire protection precautions in the interface zone. Include contact information for the local fire department, and website contacts for Wildfire Management Branch and provincial emergency programs.

7. As recommended by the local fire department, cooperate with the RDN to raise awareness of fire prevention in the interface zone at community events (i.e., Coombs Country Rodeo, Coombs Fall Fair, regional home shows), through the media (i.e., A Channel, Shaw Cable), and in local schools.
   As recommended by the fire department, highlight fuel reduction treatment at a local property.

8. Continue to encourage the local fire department to educate the public about the importance of emergency preparedness. Local first responders regularly deal with day to day emergencies. In the event of a disaster, such as a major wildfire or earthquake, normal First Responder services become overwhelmed, and cannot provide assistance to all in need.
   It is critical that each individual and each family is prepared to look after their own personal needs for a minimum of seven days.

9. Continue to ensure campground operators and users are familiarised with pertinent sections of BC's Wildfire Act (SBC 2004) – including forest fire protection and campfire restrictions.

10. Cooperate with the Wildfire Management Branch to ensure standardised implementation of Coastal fire bans throughout the Region.

11. Encourage property owners to keep their properties tidy and free of hazardous and/or unsightly junk and debris.

12. As a means of encouraging stewardship of local parks, install RDN Parks Department signage at entrance ways to trails and/or access routes of community parks. Local residents are more likely to look after neighbourhood parks, and to report any misdemeanors, if the ownership of such parcels is identified.

Vegetation Management

13. FireSmart Fuel Management. Promote the establishment and maintenance of fuel management zones around residences, businesses, and other facilities in High and Extreme interface hazard areas. Priority Zone fuel buffers should be established and maintained 0 - 10 m around all structures. Fuel reduced zones should be established and maintained 10 - 30 m around all structures.
    www.partnersinprotection.ab./ca

14. Make application to UBCM's Strategic Wildfire Prevention Program for funding to conduct operational fuel treatment at public lands (parks) interfacing development.

The provincial government estimates approximately 685,000 ha of forest lands directly interface BC communities; fuel treatment is needed to reduce the threat of wildfire.

The Strategic Wildfire Prevention Initiative is a suite of funding programs administered by UBCM and managed through the Provincial Fuel Management Working Group. Since 2004, the initiative has supported communities to mitigate risk from wildfire in the wildland urban interface. Applications for Community Wildfire Protections Plans, Fuel Management Prescriptions, Fuel Management Demonstration Projects and Operational Fuel Treatments are being accepted for all four funding streams.

Effective measures to reduce fuel loading around existing and planned development should be implemented at candidate public lands interfacing development.

Forest parks and trails serving as suitable candidates for local fuel management programs include:

- Whisky Creek parkland - reduce/remove surface/ladder fuels along forested trails, and along boundaries of park bordering new lots

- Hamilton Marsh - reduce/remove surface/ladder fuels along forested trails and at the parking lot entrance of this sensitive ecosystem complex

- Small community parks and trails – Coombs-Hilliers contains a number of undeveloped parklands and trails next to residential development. Informal trails cross some of these lands. No signage is present to indicate RDN management.
  In conjunction with RDN and local fire department, select candidate parklands and/or trails assessed in need of fuel reduction treatment next to residential development.
  Treatment aimed at reducing surface and ladder fuels could serve to highlight fuel management for the community.
  Signage is recommended to denote ownership and to promote fuel management to local residents and the visiting public.

15. In the event of a wildfire (or brush fire) in a park or on other public lands, restore ecosystem structure and function through rehabilitation and mitigation of fire effects, in accordance with the constraints imposed by the environmental features of the land.

16. Encourage property owners to landscape with fire-resistive vegetation. Develop a post on the RDN website, with information about FireSmart landscaping methods and appropriate plant species to use in interface areas.
    See FireSmart Landscaping on Southeastern Vancouver Island, Strathcona Forestry Consulting, 2004
    http://www.cityoflangford.bc.ca/document/brochures/FireSmartLandscaping.pdf

17. Encourage community volunteers to report on fire behavior in forested parks and at woodland trails.

18. Cooperate with local plant nurseries and the Invasive Plant Council of British Columbia to ban the sale of invasive plant species (e.g., English ivy, daphne, St. John's wort).

19. Strive to use crushed gravel, instead of bark mulch, on local park trails, in order to protect adjoining structures and forested areas from fire.

Building Construction and Design

20. Use fire-retardant roof covering assembly rated Class A, B, or C (i.e., metal, tile, stucco, ULC- rated asphalt) on all new development and retrofits.
Roofing is the structural material most vulnerable to fire. The type of roofing material can determine whether or not an interface fire will consume a building. Firebrands landing on a combustible roof can start a fire that will consume the building.

21. Use non-combustible siding material (i.e., stucco, metal siding, brick, cement shingles or cementitious materials, poured concrete, or ULC-rated wood siding) on all new building and retrofits.
With the exception of the roof, siding is the structural component most vulnerable to fire.

22. Follow FireSmart guidelines for design, construction, and maintenance of eaves and vents, soffits, decks, windows, etc.
http://www.partnersinprotection.ab.ca

Infrastructure

23. Ensure that development applicants are issued FireSmart pamphlets.

24. Refer development applications to the local fire department for review to ensure that access requirements and building features of any proposed development are sufficient to allow fire trucks and other emergency vehicles access to the properties and structures.

25. Review the Ministry of Environment's Open Burning Smoke Control Regulations to consider changing current burning practices to coordinate burning with suitable venting indices. Continue to post link to venting indices on the District website.

26. Strive to ensure property accesses (i.e., width, length, turning radii) are integrated as part of the RDN's newly adopted building inspection mandate at Area "F", along with properly installed and visible address signs.

27. Ensure access routes at proposed development are sufficient for fire trucks and other emergency vehicles to access properties and structures.

28. Make efforts to contact major road transportation carriers to ensure local fire department is notified of the types and amounts of hazardous materials regularly transported through the area. Be sure that carriers supply local fire department with appropriate Material Safety Data Sheets.

29. Strive to cooperate with Ministry of Transportation and Infrastructure to ensure grass along highway rights-of-way is regularly mowed to reduce potential for wildfire.

30. Continue efforts to create “through” roads, eliminating difficult-to-access addresses on roads with no cross streets.

31. Facilitate more efficient building inspections in Area “F” by encouraging RDN to create within its ranks a building inspector position for Coombs, Hilliers, and Errington.

Stakeholders

32. Make efforts to contact Crown and private forest landowners operating within and adjacent to the FPA to ensure the local fire department has up to date information about land ownership, slash burning schedules, critical emergency contacts, conditions of logging roads, and current gate keys.

Fire Protection

33. Continue to conduct pre-fire planning as part of regular practices.

34. Encourage homeowners bordering areas of extensive forest to equip their homes with personnel fire fighting equipment, including, as a minimum: shovel, rake, large water barrel, and 10-L pail.

35. During the summer fire season, ensure “fire hazard” emergency contact information is posted at entrances to public forest lands in the area.

11.0 IMPLEMENTATION

Local government must take the responsibility for implementation of the Community Wildfire Protection Plan.

The CWPP for Coombs-Hilliers should be distributed to local government within three months of the plan's submission. Recommendations in the plan should be reviewed in consideration of official adoption of the plan. An opportunity to review the plan should be provided to local stakeholders. A public review process should be scheduled within six months of the plan's submission.

Maintenance of the Community Wildfire Protection Plan should include an annual schedule for monitoring and evaluating the programmatic outcomes established in the Plan.

Regular evaluations of the Community Wildfire Protection Plan should 1) assess the effectiveness of programs, and 2) identify any changes in hazard-risk assessments. Outdated components of the plan should be updated.

Coordinating agencies responsible for various implementation processes should report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised or removed. Organizations participating in the Plan evaluation should be clearly identified in the evaluation.

Fire protection and prevention in the interface are ongoing processes. Long-term implementation of mitigative measures is essential to ensure protection for life, property, and ecological processes in the wildland urban interface.

Photo. Watering down wildfire near Slave Lake, Alberta, 2011.

12.0 REFERENCES

Agee, J.K. 1990. The historic role of fire in Pacific Northwest forests. Oregon State University Press, Corvallis, Oregon.

Area "F" Official Community Plan. RDN Bylaw No. 1152. 1999.

BC Climate Action Toolkit. www.toolkit.bc.ca/carbon-neutral-government

BC Ministry of Environment. Sensitive Ecosystem Inventory. www.env.gov.bc.ca/sei/van_gulf/

BC Ministry of Forests and Range. 1995. Forest Practices Code Biodiversity Handbook.

BC Ministry of Forests and Range. Canadian Forest Fire Behavior Prediction System. www.for.gov.bc.ca/protect

BC Ministry of Forests and Range. 1994. Land Management Handbook Number 28.

BC Ministry of Forests and Range. 2004. S-100 Basic Fire Suppression and Safety (BC Suppression Training Series).

BC Ministry of Forests and Range. 2008. Rating Interface Wildfire Threats in British Columbia.

BC Parks. www.env.gov.bc.ca/bcparks

BC Wildfire Management Branch. South Island Fire Zone.

Canadian Wildland Fire Strategy. www.ccfm.org

City of Langford. 2001. Addressing the Interface Fire Hazard. A Case Study of the District of Langford.

Environment Canada. 1984. Tables for the Canadian Forest Fire Weather Index System. Canadian Forestry Service.

Fire Underwriters Survey (FUS). 1999. Water Supply for Public Fire Protection. Insurers' Advisory Organization.

Forrex Forest Research Extension Partnership. Burning debris and managing smoke along eastern Vancouver Island. www.forrex.org

Honourable Gary Filmon. 2004. The. Firestorm 2003 Provincial Review. Vancouver, BC. www.2003.firestorm.gov.bc.ca

Invasive Plant Council of British Columbia (IPCBC). www.invasiveplantcouncilbbc.ca

NFPA (National Fire Prevention Association). www.nfpa.com

Partners in Protection. 2002. FireSmart: Protecting your community from wildfire. Edmonton. AB. www.partnersinprotection.ab./ca

Pattison, Ken. Milestones on Vancouver Island. Milestone Publications. 1973.

Pojar, J., and A. MacKinnon. 1994. Plants of Coastal British Columbia. BC Ministry of Forests and Lone Pine Publishing.

Regional District of Nanaimo. www.rdn.bc.ca

Resources Inventory Committee. Standards for Terrestrial Ecosystem Mapping in BC. 1998. Ecosystems Working Group of the Terrestrial Ecosystems Task Force.

United Nations Intergovernmental Panel on Climate Change (ipcc). www.ipcc

Vancouver Island. vancouverIsland.com

Wildfire Management Branch. www.for.gov.bc.ca/Protect

Wildland Fire Management Working Group. www.ccfm.org

APPENDIX 1. INTERFACE WILDFIRE FUEL PLOT DATA

Table. Interface Wildfire Fuel Plot Summary Data – Coombs-Hilliers

Location	Easting	Northing	Fuel Type	Structural Stage (Appendix 5)	Fire Behaviour	Risk of Ignition	Structures at Risk	HIRV	Wildfire Threat Rating
1.Dudley Marsh	395.773.77	5,459,933.32	C	3b	L	L	L	L	VL
2.Hamilton Marsh	393,788.14	5,463,697.78	N/A	N/A	L	L	L	L-M	VL
3.Hamilton Marsh environs	393,878.65	5,463,868.29	C	5	M	M-H	L	M-H	H
4. Hilliers commercial core	388,614.26	5,463,267.82	N/A	N/A	M	L	M	M	M
5.French Creek riparian	390,162.12	5,464,242.40	N/A	N/A	L	L	L	L	VL
6.Eld Rd	387,175.33	5,462,198.13	C	4/5	H	M	M-H	M-H	H
7.Little Qualicum Falls Prov. Park (entrance)	387,722.78	5,463,177.21	C	5	H	H	M	H	H
8.Little Qualicum Falls Park rail RoW	387,897.65	5,463,282.15	C	2b/3a	H	H	L	M-H	H
9.Old logging slash, Hiway 4	386,693.71	5,461,706.54	S-3	3a	M	M	M	M-H	M-H
10.Kriscott Road residential	388,979.86	5,462,333.47	C	4	M-H	M-H	H	H	H
11.Chatsworth Rd/Walz Rd mixed residential	389,150.56	5,461,522.65	C	5	M-H	M-H	H	H	H
12.Tralee Road light industrial	389,662.66	5,462.077.42	C	4	M-H	M-H	M-H	H	H
13.park dedication S of Whisky Ck	389,687.05	5,463,034.56	C	5	H	M-H	M-H	H	H
14. Harris Cres. Residential	388.614.26	5,463,267.82	C	5	M	M	H	M-H	M-H
15.Harris Cres Park	390,412.62	5,463,022.36	C	5	M	M	M	M-H	M-H
16.Poplar Way residential	390,516.16	5,462,674.87	N/A	N/A	M	M	H	M-H	M-H
17.Brooklin Ln/Dogleg Rd mixed use	392,078.06	5,462,882.15	C	3a/4/5	M-H	M-H	H	H	H
18.Howard Rd farmland	392,346.30	5,462,485.88	0-1	1	L	L	M	M	M
19.Milo Rd residential	392,102.45	5,462,138.38	C	4-5	M-H	M-H	H	H	H
20.Slash-private land	391,425.74	5,460,892.28	C	4-5	M-H	M	M	M-H	H
21.Melon Rd residential	391,102.45	5,461,178.81	C	5	M-H	M-H	H	M-H	H
22.Hilliers Rd S/railroad	391,809.82	5,463,071.13	C/0-1	2b/3a,b/5	M	M	M-H	M-H	H
23.Coombs Country Rodeo Grounds	395,120.17	5,462,098.45	C/0-1	2b,3a/5	M	M-H	M	M-H	H

24. Coombs Country Market back parking lot	**396,647.93**	**5,462,281.34**	**C/Dist**	**5**	**M**	**H**	**H**	**H**	**H**
25.SunKing Rd residential	**397,708.70**	**5,463,256.77**	**0-1/C**	**2b/3a/5**	**M**	**M**	**M-H**	**M-H**	**H**
26.Shawn Rd - Woodlot	**397,584.32**	**5,462,747.72**	**S**	**3a**	**M**	**M**	**M-H**	**M-H**	**H**
27.Palmer Rd/Shearme Rd residential	**384,514.04**	**5,461,743.68**	**C**	**5**	**M**	**M**	**M-H**	**M-H**	**H**
28.Station Rd/Grafton Rd residential	**396,869.23**	**5,460,620.68**	**C**	**5**	**M**	**M**	**M-H**	**M-H**	**H**
29.Tralee Rd/Chatsworth Rd extraction	**389,232.52**	**5,462,022.86**	**N/A**	**N/A**	**L**	**M**	**M**	**M**	**M**
30.Private logging	**388,955.37**	**5,463,581.20**	**C**	**5**	**M**	**M-H**	**M**	**H**	**H**
31.Melrose Rd residential	**388,582.76**	**5,463,369.48**	**C**	**5**	**M-H**	**M-H**	**M-H**	**H**	**H**
32.Hydro powerline RoW	**388,378.49**	**5,463,257.11**	**C/Dist**	**3a,b,4**	**M-H**	**M-H**	**M**	**H**	**H**
33.Burbank Rd. Firehall No 2 area	**391,958.93**	**5,462,663.07**	**C**	**5**	**M-H**	**M**	**M**	**M-H**	**H**
34.SunKing Rd E Mixed use	**397,546.29**	**5,463,362.91**	**C/0-1**	**2/3/5**	**M-H**	**M**	**M**	**M-H**	**H**
35.Virginia Road mixed use	**397,448.14**	**5,461,732.08**	**C/ 0-1**	**3a/5**	**M-H**	**M**	**M**	**H**	**H**
36.Kordonan Rd residential	**389,046.51**	**5,462,913.62**	**C**	**5**	**H**	**H**	**H**	**H**	**H**
37.Carson Rd end	**390,219.53**	**5,459,844.04**	**D-1/ S-3**	**3a/b**	**H**	**H**	**M**	**H**	**H**
38.Malcolm Rd end mixed use	**389,439.89**	**5,462,685.18**	**C**	**5**	**H**	**H**	**H**	**H**	**H**
39.Winning Way/Marples mixed use	**388,764.52**	**5,481,205.05**	**C**	**5**	**H**	**H**	**H**	**H**	**H**
40. Coombs village centre	**396,697.56**	**5,462,321.90**	**N/A**	**N/A**	**M**	**M**	**H**	**M**	**M**
41.Coombs fairgrounds	**396,812.21**	**5,462,221.58**	**0-1/C**	**2/3a,b**	**M-H**	**M**	**H**	**H**	**H**
42. Clarke Rd. sawmill	**390,964.72**	**5,461,519.30**	**N/A**	**N/A**	**M**	**M-H**	**H**	**H**	**H**
43.Whisky Ck FSR logging	**389,735.65**	**5,644,142.95**	**C**	**3a,b**	**M**	**M-H**	**H**	**H**	**H**
44. Former TW lands – now acreages	**395,632.97**	**5,457,457.99**	**C**	**4,5**	**H**	**M-H**	**M-H**	**H**	**H**
45. Hilliers Rd. S	**393,114.7**	**5,464,215.84**	**C**	**3a,b**	**M**	**M**	**M-H**	**H**	**H**
46. Melrose Hydro RoW	**388.467.79**	**5,463,326.27**	**C/M**	**3a,b**	**H**	**H**	**H**	**H**	**H**
47. Whisky Ck FSR/Melrose	**389,003.29**	**5,463,301.93**	**C**	**4,5**	**H**	**H**	**H**	**H**	**H**

L=Low, M=Moderate, H=High, E=Extreme

Fuel Types: C=Coniferous, D=Deciduous, M=Mixed Forest, 0=Shrub-dominated, S=Slash

APPENDIX 2. REFERENCE PHOTOS – FUEL SAMPLE LOCATIONS

Ref. No. 2: Hamilton Marsh

Ref. No. 3: Hamilton Marsh environs

Ref. No. 4: Hilliers Commercial

Ref. No. 6: Eld Road area

Ref. No. 7: Little Qualicum River Provincial Park

Ref. No. 8: Little Qualicum River Prov Park/rail line

Ref. No. 9: “greened-up” slash along Highway 4

Ref. No. 10: Brush near Kriscott Road

Ref. No. 11: Chatsworth Road area

Ref. No. 12: wood processing, Tralee Road

Ref. No. 13: forested parkland, S. of Whisky Ck store

Ref. No. 14: Poplar Way subdivision area

Ref. No. 15: Harris Cres. park

Ref. No. 17: Brooklin Way/Dogleg Road

Ref. No. 18: Howard Road farm

Ref. No. 19: lodgepole pine stands, Milo Road area

Ref. No. 21: Melon Road area

Ref. No. 22: Hilliers Road S

Ref. No. 23: Coombs Country Rodeo Campground

Ref. No. 24: Coombs Country Market rear parking

Ref. No. 25: Sun King Road residential

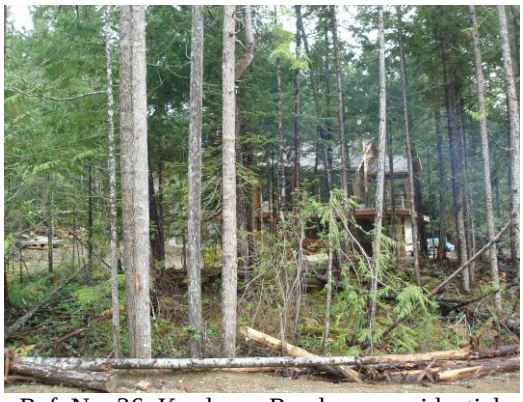
Ref. No. 26: Woodlot on Shawn Road

Ref. No. 29: Tralee Rd/Chatsworth aggregate extraction

Ref. No. 32: BC Hydro powerline RoW Whisky Ck

Ref. No. 33: Burbank Road area Firehall No. 2

Ref. No. 35: Virginia Road mixed use



Ref. No. 36: Kordanan Road, new residential

Ref. No. 37: poplar slash, end of Carson Road

Ref. No. 39: Winning Way/Marples Way mixed use

Ref. No. 40: Coombs village centre

Ref. No. 41: Coombs Country Fairgrounds

Ref. No. 42: Clarke Rd sawmill

Ref. No. 44: Acreage for sale, Pratt Rd.

Ref. No. 45: Whisky Ck FSR

Ref. No. 47: Whisky Ck FSR

APPENDIX 3. INTERFACE WILDFIRE THREAT MAPPING

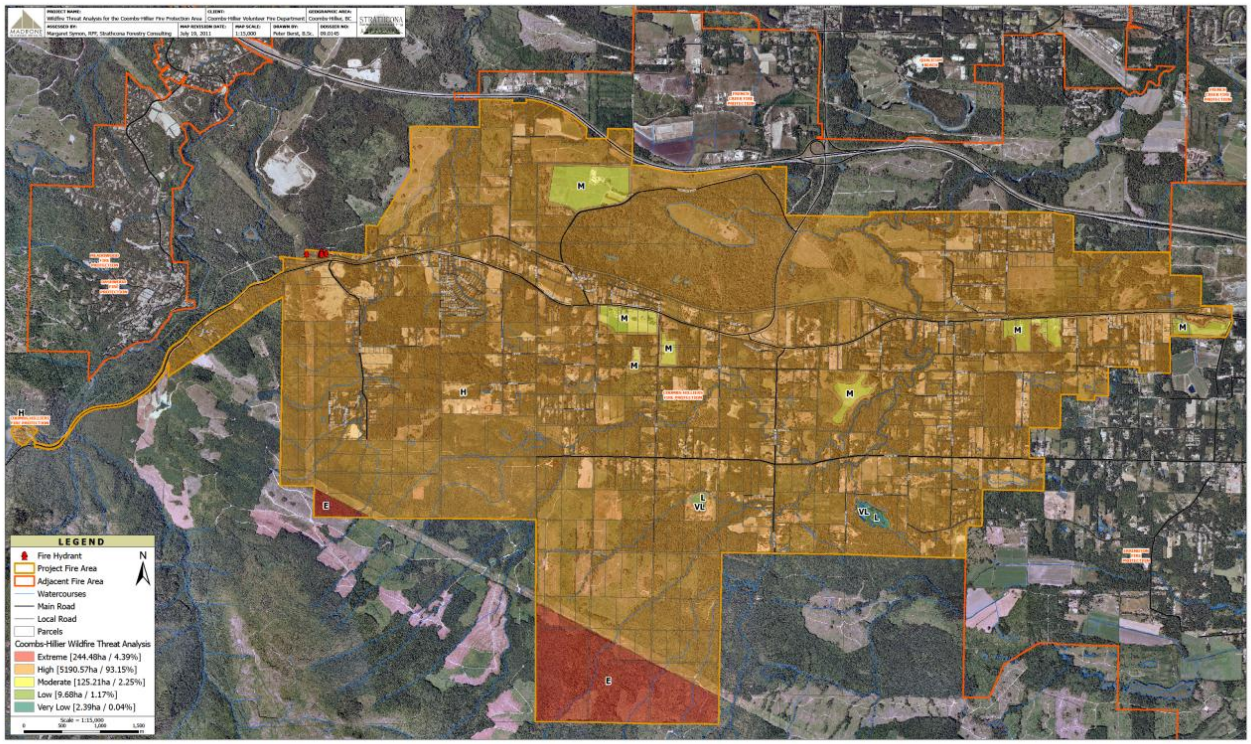


Figure. Wildfire Interface Threat Mapping, Coombs-Hilliers.

APPENDIX 4. FUEL TYPES

Coniferous (C) Fuel Types – includes a range of subtypes, based on type of species, stand structure, stand age

General characteristics	**Subtypes**: C-1 (very open coniferous stands) C-3 (mature lodgepole pine) C-4 (immature lodgepole pine) C-5 (moderately well stocked, mature coniferous stands) C-6 (fully stocked immature coniferous stands with sparse understorey)
Major tree species:	C-1, C-5, C-6: *Pseudotsuga menziesii* (Douglas-fir), *Thuja plicata* (Western redcedar) - less dominant, *Abies grandis* (Grand fir) – minor component; *Tsuga heterophylla* (western hemlock) – minor component on cooler aspects in CWHxm C-3, C-4: *Pinus contorta* (lodgepole pine)
Minor tree species:	C1, C5, C6: *Thuja plicata* (Western redcedar), *Abies grandis* (Grand fir); *Tsuga heterophylla* (western hemlock) - on cooler aspects in CWHxm *Arbutus menziesii* (Arbutus) – warm, well-drained slopes in CDFmm C-3, C-4: *Pinus contorta* (lodgepole pine)
Understorey vegetation	C-1, C-4, C-5: Discontinuous to continuous. Variable mix of shrubs and herbs: *Gaultheria shallon* (salal), *Polystichum munitum* (sword fern), *Mahonia nervosa* (Oregon-grape), *Holodiscus discolor* (ocean spray), *Pteridium aquilinum* (bracken fern), and mosses C-3, C-6: Discontinuous to sparse
Forest Floor and organic layer	C-1, C-4, C-5: Shallow to moderately shallow organic layer (duff), consisting of needle litter, small twigs, cones, and feather moss C-3, C-6: Typically the forest floor layer is moderately deep; comprised of needle litter, small twigs, cones, and dry mosses
Stand density	C-1: scattered clumps of trees C-3: >2000 stems per hectare (sph) C-4: >1200+ sph C-5: <300 to app. 1200 sph C-6: 1200+ sph
Stand structure and composition	C-1: open C-3: densely stocked stands; lower branches may or may not extend to ground C-4: moderately to densely stocked stands; tree branches may extend to ground C-5: moderately well-stocked stands; tree branches are usually separated from ground C-6: well-stocked stands; tree branches generally not separated from ground
Surface and Ladder Fuels	Proportion of ladder fuels varies with age of stand, stocking, stand health.
Crown closure	>90% (C-3, C4) to <10% (C-1)
Height to Live Crown	Variable: < 0.5 m (C-1) to 1+ m (C-4) to >3 m (C-5)
Effect on fire behavior	Variable effects depending on density of stand, surface and ladder fuel loading, height to live crown. An ignition under "crossover conditions" presents the most dangerous situation. Thickness of duff layers increases chance of ignition and spread. Ladder fuels increase potential for surface fire climbing into crowns. Mean stand crown base height controls Rate of Spread and crowning. Dense stands with high fuel loading and continuous ladder fuels pose greatest risk. Crown fires spread quickly, and are difficult to control.

Extent: Coniferous Fuel Types, the most prevalent fuel type at Coombs-Hilliers, exhibit a wide range of variability.

Photos. Coniferous Fuel Types at Coombs-Hilliers exhibit a wide range of structure and composition types.

Mixed Wood Stands

General characteristics	**Subtypes**: M-1 (mixedwood - leafless) – spring and fall M-2 (mixedwood - green) – summer
Predominant tree species	*Pseudotsuga menziesii* (Douglas-fir), *Thuja plicata* (Western redcedar), *Abies grandis* (Grand fir), *Alnus rubra* (Red alder), *Acer macrophyllum* (Broad-leaf maple)
Understorey vegetation	Discontinuous to continuous. Typically features diverse mix of species: *Rubus spectabilis* (salmonberry), *Cornus stolonifera* (Red osier dogwood), *Gaultheria shallon* (salal), *Polystichum munitum* (sword fern), (Oregon-grape), *Tiarella trifoliata* (Foamflower), and mosses
Forest Floor and organic layer	Discontinuous to continuous leaf and needle litter Organic layers are generally uncompacted and friable
Stand density	<300-1500 sph
Stand structure and composition	Multi-layered stands common, often with distinct tree canopy layer, shrub layer, and herb layer. Horizontal and vertical differentiation.
Understorey	Shrub and herb layers discontinuous to continuous
Surface and Ladder Fuels	Ladder fuels may or may not extend to crowns
Crown closure	Variable: <50-100%
Height to Live Crown	Variable: < 3 m to > 10 m.
Effect on fire behavior	Low to Moderate. Low to mod. capability of carrying surface fire. Risk of ignition and fire spread increases during extreme fire weather in stands with high surface fuel loading. Local stands contain sufficient proportion of combustible coniferous trees to sustain and spread a wildfire, especially during extreme fire weather. Fuel types differentiated by season and % of coniferous &deciduous species composition.

Extent: localized distribution; often associated with receiving slopes and wetter areas, and disturbed areas

Photo. Mixed wood fragmented forest stand near residential development at Coombs-Hilliers.

Deciduous (D)

General characteristics	
Major tree species	*Alnus rubra* (Red alder), *Acer macrophyllum* (Broad-leaf maple)
Lesser tree species	*Prunus emarginata* (Bitter cherry), *Malus fusca* (Pacific crab apple)
Understorey vegetation	Discontinuous to continuous. Typically features mix of shrubs, including various hydrophylic species: *Rubus spectabilis* (salmonberry), *Cornus stolonifera* (Red osier dogwood), *Lonicera involucrata* (Twinberry)
Forest Floor and organic layer	Continuous leaf litter; shallow, uncompacted organic layer
Stand density	<300-1600 sph
Stand structure and composition	Moderate differentiation into horizontal and vertical structure.
Surface and Ladder Fuels	Medium to tall shrubs and herb layers Moderate dead, down woody fuels
Crown closure	Variable: <45-100%
Height to Live Crown	Variable: < 3 m to > 10 m.
Effect on fire behavior	Low. Low risk of ignition and spread during extreme fire weather Surface fuels are generally shaded and moist; low capacity for "drying out". Shaded understorey layers and moist conditions limit potential fire spread. Low combustibility.

Extent: localized distribution; generally limited to riparian areas and/or successional areas

Photo. A former commercial poplar plantation at Coombs-Hilliers constitutes a Deciduous Fuel Type.

Slash and Downed Woody Debris (S-3)

General characteristics	Subtype: S-3 (Coastal cedar/hemlock/Douglas-fir slash)
Tree species	Variable. *Thuja plicata* (Western redcedar) slash has high combustibility
Understorey vegetation	N/A
Organic layer	Moderately deep to deep uncompacted to compacted organic layer
Stand density	N/A
Structure and composition	Variable: compacted large woody debris, to small woody debris and combustible aerial fuels (fine branches)
Surface and Ladder Fuels	Generally N/A
Crown closure	N/A
Height to Live Crown	N/A
Effect on fire behavior	Low to Moderate to High Fire Risk, depending on type and extent of slash, and weather conditions. Cedar has high foliage retention. Cured small woody debris easily ignited during warm, dry conditions. Highly combustible under certain conditions.

Photo. New slash (left) and greened-up slash (right) at Coombs-Hilliers.

Grass Fuel Type (0-1)

Structure classification	Subtype: 0-1b (standing dead grass in late summer to early fall)
Major tree species	Generally N/A. Terrestrial herbaceous ecosystems have sparsely wooded forest stands that may include grassy understorey component.
Other vegetation	Scatttered and discontinuous shrub cover may be present, including invasive *Cytisus scoparius* (broom) and *Rubus discolor* (Himalayan blackberry), *Holodiscus discolor* (ocean spray), *Arctostaphylos columbiana* (manzanita). Various herbs may be present.
Forest Floor and organic layer	N/A
Stand density	Low density (i.e., clumps) to no forest cover.
Stand structure and composition	N/A Generally open areas.
Forest Floor	Continuous live and dead (may be cured depending on weather) grass litter Moderately shallow, moderately compacted organic layer.
Surface and Ladder Fuels	Generally discontinuous -in early summer: grass is generally green -in late summer and early fall – dried, cured grasses pose fire hazard
Crown closure	Generally N/A; woodland ecosystems are relatively open.
Height to Live Crown	Generally N/A: generally > 3 m.
Effect on fire behavior	Low to Moderate (to High under extreme weather conditions). Moderate to high risk of ignition & spread (depending on season) -in early summer: grass is generally green -in late summer, cured grasses and dried woody surface fuels pose fire hazard. Scattered trees, if present, generally do not significantly affect fire behavior. Standard loading is 0.3 kg/m2, but other loading must be accommodated: % cured or dead must be estimated (more common in the interior than on the coast). On the coast, late summer standing cured grass is prevalent fuel type. Clumps of brush species (i.e., broom) and scattered trees may increase potential for fire spread.



Photos. Grass Fuel Types.

APPENDIX 5. STRUCTURAL STAGES AND CODES

Structural stages and codes

From Standards for Terrestrial Ecosystems Mapping in British Columbia. 1998. Ecosystems Working Group of the Terrestrial Ecosystems Task Force, Resources Inventory Committee.

Structural stage	Description
Post-disturbance stages or environmentally induced structural development	
1 Sparse bryoid	Initial stages of primary and secondary succession
Substages	
1a Sparse	<10% vegetation cover
1b Bryoid	Bryophyte- and lichen-dominated communities
Stand initiation stages or environmentally induced structural development	
2 Herb	Early successional stage or herbaceous communities Maintained by environmental conditions or disturbance; time since disturbance <20 yrs for normal forest succession
Substages	
2a Forb-dominated	Herbaceous communities dominated by non-graminoid herbs
2b Graminoid-dominated	Herbaceous communities dominated by grasses, sedges, reeds, and rushes
2cAquatic	Herbaceous communities dominated by floating or submerged aquatic plants
2dDwarf shrub	Communities dominated by dwarf woody species
3 Herb/Shrub	Early successional stage or shrub communities maintained by environmental conditions or disturbance; dominated by shrubby vegetation; seedlings and advanced regeneration may be abundant
Substages	
3a Low shrub	Communities dominated by shrub layer vegetation < 2m tall; seedlings and advanced regeneration may be abundant; time since disturbance <20 yrs for normal forest succession
3b Tall shrub	Communities dominated by shrub layer vegetation that are 2 – 10 m tall; time since disturbance <40 yrs for normal forest Succession

Stem exclusion stages

4 Pole/Sapling	Trees > 10 m tall, typically densely stocked, have overtopped shrub and herb layers; time since disturbance usually <40 yrs for normal forest succession; up to 100+yrs for dense (5 000-15 000+ st/ha) stagnant stands
5 Young Forest	Self-thinning has become evident; forest canopy has begun differentiation into distinct layers (dominant, main canopy, and overtopped); time since disturbance generally 40-80 yrs, but may begin as early as age 30

Understorey re-initiation stage

6 Mature Forest	Trees established after the last disturbance have matured; time since disturbance generally 80-250 yrs for CDFmm
7 Old Forest	Old, structurally complex stands composed mainly of shade-Tolerant and regenerating tree species; snags and coarse woody Debris in all stages of decomposition typically, as are patchy understoreys; time since disturbance generally >250 yrs

APPENDIX 6 GLOSSARY OF TERMS

Biogeoclimatic units: geographic areas influenced by similar regional climates

Biogeoclimatic Ecosystem Classification (BEC): a system that groups similar segments of the landscape into categories of a hierarchical classification system that combines three major classifications: climate, vegetation, and site

Brunisol Soil: Soil Great Group with weak soil development; common on southeastern Vancouver Island

Buildup Index: (used in CFFDRS - combines Duff Moisture Code and Drought Code) – a numeric rating of the total amount of fuel available for combustion

CAR: Canadian Aviation Regulation

CDFmm: moist maritime Coastal Douglas-fir Biogeoclimatic Subzone

CFFDRS: Canadian Forest Fire Danger Rating System – a model developed by Forestry Canada for evaluating forest fire danger

CH: Coombs-Hilliers

CHVFD: Coombs-Hilliers Volunteer Fire Department

CWPP: Community Wildfire Protection Plan

CWHxm: very dry maritime Coastal Western Hemlock Subzone

Crown Fires: burn foliage and branches in the upper canopy, and also consume surface and ground fuels

DC: Drought Code – a numerical rating of the average moisture content of deep, compact organic layers

DGR: Fire Danger Class Ratings (1 to 5) calculated based on fire weather indices

DMC: Duff Moisture Code – a numerical rating of the average moisture content of loosely compacted organic layers of moderate depth

Development Permits / Development Permit Areas: authorised under the Government Act, these local planning tools, which are outlined in the Official Community Plan, address specific conditions, including protection of development from hazardous conditions (i.e., wildfire)

Ecosystem: for purposes of the BEC, an ecosystem is defined as a particular plant community and its associated topography, soil, and climate

FNESS: First Nation Emergency Social Services

FBP: Fire Behavior Prediction system – modeling that predicts the rate of spread, fuel consumption, and intensity of wildfires

Field mapping: mapping of physical features and key resources

Fire Behavior: the manner in which fuel ignites, flame develops, and fire spreads

Fire Behavior Triangle: three elements of the fire environment – fuel, weather, and topography – affect fire behavior

Fire Behavior Output Factors: fire intensity, rate of spread, crown fraction burned
Fire Danger: a description of the combination of both constant and variable factors that affect the initiation, spread, and difficulty to control a wildfire on an area

Fireflow: water supply for firefighting

Fire Protection Improvement District: autonomous local government body that is administered by an elected board of trustees, and is responsible for providing one or more local services (i.e., fire protection) for the benefit of the residents of the community

Fire Season: officially April 1 to October 31

Fire Service Area: area served by the local Fire Department

"Forestry": Wildfire Management Branch

Fuel: any substance which will ignite and burn

FireSmart Fuel Modified Zones: (distances vary according to location, lot size, aspect, slope, etc.):
Priority Zone 1 (fuel removal 0-10 m around structure);
Priority Zone 2 (fuel reduction or conversion 10-30 m around structure);
Priority Zone 3 (fuel reduction 30-100 m around structure)

Fuel loading: total amount of vegetative fuel available for potential combustion

Fuel treatment: manipulation of vegetative (and structural) fuels by harvesting, chipping, burning, composting, or other means

Fuel treatment priorities: management of vegetative (and structural) fuels prioritised according to hazard, risk, safety, funding, etc.

FWI: Fire Weather Index – accounts for the effects of fuel moisture and wind on ignition potential and probable fire behavior

GIS: Geographic Information System – GIS is a computer technology that uses a geographic information system as an analytic framework for managing and integrating data, solving a problem, or understanding a past, present, or future situation

Ground fires: burn in the duff layer (organic soil) and decaying woody material beneath the forest floor

Hazard: the product of risk, vulnerability, exposure, and the capacity of humans to respond to extreme conditions

HIRV: Hazard, Impact, Risk and Vulnerability – an analysis model – designed as a community based-approach to sustainable hazard mitigation

Impact: assessed through the use of social, environmental, economic, and political factors

Improvement Districts: autonomous local government bodies responsible for providing one or more local services for the benefit of the residents in a community. Improvement Districts vary considerably in size, from small subdivisions, to urban communities. Improvement Districts are usually located in rural areas of the province where there was no alternative form of local governance available, suitable, or desirable for the community. Improvement Districts are similar in structure to a municipality but are more informal and only provide direct services such as waterworks and fire protection.

Interface fires: fires that have the potential to simultaneously involve both structures (and/or other manmade developments) and wildland fuels

Interface Wildfire Threat: standardized wildfire threat ratings in British Columbia

ISI: Initial Spread Index – a numerical rating of the expected rate of spread of a fire

Ladder Fuels: aerial fuels that act as a conduit to help spread a fire upward into the tree canopy

Leeward Island Mountains Ecosection: upper, hilly counterpart of Nanaimo Lowland Ecosection

MoFR: BC Ministry of Forests and Range

NFPA: National Fire Protection Association

Nanaimo Lowland Ecosection: coastal plain on the south-eastern margin of Vancouver Island. The Ecoregion is the product of a relatively dry, mild climate in the rain shadow of the Vancouver Island Mountain Range. It is one of the most ecologically diverse areas in North America.

NOTAM: Notice to Airmen

OCP: Official Community Plan

Ortho photos: 3-dimensional mapping developed from satellite imagery and digital elevation models

PEP: Provincial Emergency Program

Podzol: Soil Great Group characterised by podzolic B horizon

Priority Zones: See FireSmart Fuel Modified Zones

Probability of ignition: for the purposes of this report, the probability of ignition can be accounted for by assigning a higher hazard rating to areas where fires are most likely to be started

RDN: Regional District of Nanaimo

Risk: the measure of probability of occurrence of an event and the expected severity, and an analysis of potential factors (human or natural) which can contribute to the potential for fire occurrence

STS: Superior Tanker Shuttle

Slash loading: branches, limbs, and coarse woody debris left on the forest floor after logging

Suppression constraints: obstacles to extinguishing a fire (i.e., little or no water, difficult access, limited manpower, challenging weather conditions, etc.)

Surface fires: start on the forest floor, where they consume needles, twigs, logs, and branches; if left unchecked, will burn elevated fuels (lower branches of trees; partially downed trees; tall shrubs) above the forest floor

TCH: TransCanada Highway

UBCM: Union of British Columbia Municipalities

Vulnerability: the ability of people, property, industry, resources, and areas of environmental and historic concern to weather, resist, or recover from the impacts of a hazard in the long term as well as the short term

WMB: Wildfire Management Branch

Wildfire Severity: measured through analysis of: fuel types, risk of ignition, structures at risk, and suppression constraints

Wildland-Urban Interface (WUI): the zone where structures, businesses, and other human activities and pursuits are situated among trees and other combustible vegetation

Wildfire Interface Threat Rating: application of fire behavior modeling to evaluate the ability of forestland surrounding and abutting structures to support a wildfire

Wildfire Interface Threat Rating classes:
Low – urban, suburban, and farm areas with modified forest fuels, generally flat terrain; no readily combustible vegetation; low risk to adjacent development
Moderate – partially modified forest fuels; scattered mixed forest in suburban areas; moderate to good water availability; homes and structures may be threatened
High – areas with little or no fuel modification; continuous ground fuels; sloping terrain with/without gullies present; moderate to low availability of water; some areas hard to access
Extreme – areas with little or no fuel modification, continuous ground fuels; rolling and gullied terrain; rock outcrops may be present; low water availability; some inaccessible terrain; may or may not be heavy use areas; direct threat to homes/structures/values.

Wildland Urban Interface (WUI): areas where structures and human developments are located next to, or in the midst of, trees and other combustible vegetation