
# Community Wildfire Protection Plan

Deep Bay Waterworks District, BC

November, 2006

Developed through a grant from the Union of British Columbia Municipalities to:
Deep Bay Waterworks District
(for the Deep Bay Volunteer Fire Department)

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- Regional District of Nanaimo


- Ministry of Forests and Range

- Union of British Columbia Municipalities.

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## 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 (ecosystems) 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: (combines Duff Moisture Code and Drought Code) – a numeric rating of the total amount of fuel available for combustion.

CDFmm: moist maritime Coastal Douglas-fir biogeoclimatic unit.

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

CWPP: Community Wildfire Protection Plan

CWHxm: Very Dry maritime Coastal Western Hemlock Subzone

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

Development Permits / Development Permit Areas: local planning tools.

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

Field mapping: mapping of physical features and key resources

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. Four adjective fire danger ratings are used to describe danger levels in public information and fire prevention signing: Low, Moderate, High, and Extreme.

Fire Season: officially April 1 to October 31

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

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

Fuel treatment: manipulation of vegetative (and structural) fuels through 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 – a numerical rating of the fire intensity - combines ISI and BUI.

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.

Hazard: the product of risk, vulnerability, exposure, and the capacity of human 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 factors, environmental factors, and political factors.

Interface Hazard Ratings: a relative scale of interface fire hazard: Low (not directly adjacent to or cannot be directly impacted by wildfire); Moderate (suppression success likely); High (suppression success unlikely); Extreme (suppression will not be successful).

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

MOFR: Ministry of Forests and Range

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.

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

Podzol: Soil Great Group characterised by podzolic B horizon

Priority Zones: See 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.

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.)

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.

Wildland urban interface: the zone where structures, businesses, and other human activities and pursuits are situated among trees and other combustible vegetation.

Wildfire on the front ranges of the Rockies.

# COMMUNITY WILDFIRE PROTECTION PLAN

# DEEP BAY WATERWORKS DISTRICT, BC

## SYNOPSIS

1. The small community served by the Deep Bay Waterworks District contains several interface areas at elevated risk from wildfire.

2. In 2006, the Deep Bay Volunteer Fire Department, on behalf of the Deep Bay Waterworks District, received a grant from the Union of British Columbia Municipalities to develop a Community Wildfire Protection Plan -
   1) to define risk areas for interface fires,
   2) to identify measures necessary to mitigate risks; and
   3) to outline an action plan (see Executive Summary) for improving fire protection and prevention in the interface.

3. If implemented over the next several years, the actions identified in the Community Wildfire Protection Plan will help the Deep Bay Waterworks District clarify and refine priorities for the protection of life, property, and essential infrastructure and resources in the interface zone.

# SECTION 1: INTRODUCTION AND PLANNING PROCESS

### BACKGROUND

In many areas of British Columbia, wildland areas containing flammable vegetation – trees, brush, and grasses – exist in close proximity to rural and urban areas containing structures where people live, work, and recreate. The interface zone is commonly described as the area where structures, facilities, and human activities are situated among trees and other combustible vegetation (FireSmart, 2nd Edition, 2003).

### WILDFIRES AND INTERFACE FIRES IN BRITISH COLUMBIA

Wildfires are a part of the natural ecological cycle of forests in British Columbia. Wildfires have been a major and regular occurrence – and a major hazard – for thousands of years in British Columbia. British Columbia's climate and topography make the province particularly vulnerable to wildfires.

Prior to European settlement, wildfires shaped the landscape in many areas of the Pacific Northwest. Interface fires increased with the arrival of non-aboriginal peoples in BC. In 1886, an out-of-control slash fire raged through the pioneer city of Vancouver. Forest fires in Fernie in 1903 and 1908 destroyed the community and left thousands homeless. Another out-of-control slash fire, the Great Vancouver Island fire, wiped out 30 000 ha of forests in July 1938 in a 20-km swath south of Campbell River, a short distance north of Deep Bay.

The presence of people near wildland areas has resulted in aggressive fire suppression activities to protect life and limit property damage. As a result, the natural pattern of frequent low-intensity fires has been disrupted. Increased fuel loading combined with warmer, drier summers in recent years places many areas of the province at extreme risk from wildfire. At risk are loss of life, property, infrastructure, and resources. Fire suppression in the interface zone entails one of the most dangerous operations for fire fighters.

### INTERFACE PLANNING IN BC

For decades, the Ministry of Forests and Range Protection Branch has advocated community-based interface planning. After serious interface fires at Penticton and Salmon Arm in the 1990's, the Auditor General urged BC communities to take action. Public awareness of the danger of interface fires peaked in the hot dry summer of 2003, when unprecedented wildfires ravaged BC'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, and resulted in the loss of lives of three fire fighting airmen.

### COMMUNITY WILDFIRE PROTECTION PLAN PROGRAM

In the aftermath of Firestorm 2003, the province of BC commissioned The Honourable Gary Filmon to review the damage caused by the devastating wildfires. The "Firestorm 2003 Provincial Review" provided impetus for BC communities to participate in strategic interface planning.

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 CWPP 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 intent of the CWPP is to establish a cooperative framework under which interface management programs are developed and implemented to protect human and natural resources values in an effective and efficient manner.

Photo 1. Deep Bay Waterworks District (rims the Vancouver Island coastline in the background) sits on Baynes Sound across from Denman Island (foreground). Extensive forests surround the Deep Bay Waterworks District.

# SECTION 2: PROFILE OF DEEP BAY WATERWORKS DISTRICT

## GEOGRAPHY AND HISTORY

Deep Bay Waterworks District serves a small oceanside community on the east coast of Vancouver Island, in a region known as Lighthouse Country (Baynes Sound area of Georgia Strait). Long before European settlers arrived on the island, the area's productive shellfish and fisheries resources played a vital role in the lives of indigenous peoples of the northwest coast.

Deep Bay Waterworks District and its neighbouring communities in Lighthouse Country were established in the last century as farming, fishing, and logging settlements. Between the First and Second World Wars, billions of board feet of lumber arrived by railroad from the logged hills around Horne Lake to the natural, deep-water port at Deep Bay, to be shipped around the world. In the 1950's, completion of a coastal highway attracted tourism to the area. Construction of the Inland Island Highway in the late 1990's drew traffic from the coastal route, but residential growth has grown steadily in the scenic Lighthouse Country. Deep Bay Waterworks District began to prosper as a residential resort community (Photos 1, 2). Deep Bay Waterworks District is designated as an Improvement District.

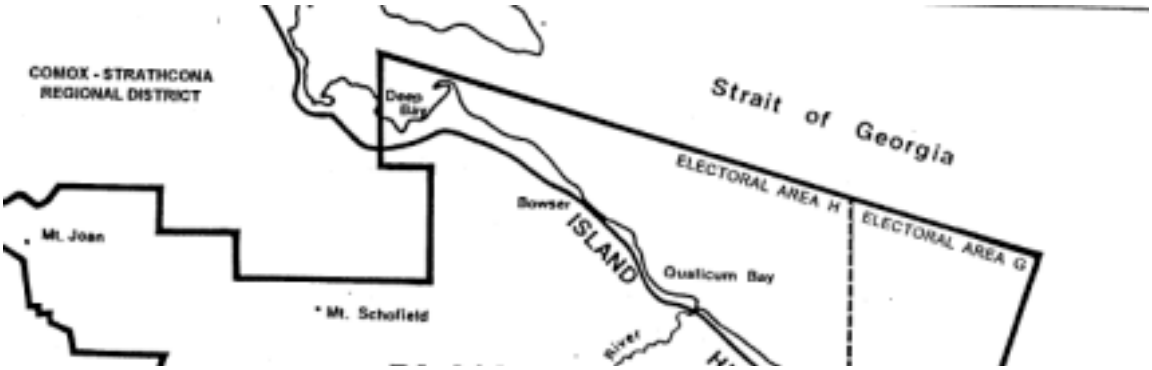



Figure 1. The Deep Bay Waterworks District sits across from Denman Island, on Baynes Sound, in the Strait of Georgia. Deep Bay Waterworks District lies in Electoral Area H, at the northern end of the Regional District of Nanaimo (RDN).

Photos 1, 2. Deep Bay Waterworks District serves a small oceanside community.

**POPULATION**

The community served by the Deep Bay Waterworks District has roughly 550 residences with a population of approximately 1500 people. The population is concentrated in well-maintained residential neighbourhoods close to the coast (Photos 3, 4). A significant proportion of the population is retired. Growth rate in recent years has been modest (app. 2%).

Photos 3, 4. Residential properties at the Deep Bay Waterworks District are generally concentrated near the coast.

Deep Bay Waterworks District is situated in the traditional territory of the Qualicum First Nation peoples. There are no First Nation reserves at Deep Bay.

At Deep Bay harbour, a small section of grassy hillside has been fenced to protect a First Nations archaeological site (ancestral burial site). Tall dry grass and broom adjacent to and within the enclosure could potentially constitute a fire hazard in summer (Photo 5).


Photo 5. Protected First Nation archaeological site at Deep Bay harbour.

**AREA**

The Fire Protection Area (FPA) served by the Deep Bay Waterworks District occupies a long narrow fringe along the coast of eastern Vancouver Island. Extending approximately 6 km between Fanny Bay (to the northwest) and Bowser (to the southeast), the Fire Protection Area occupies an area of approximately 5 $km^2$. Highway 19 generally delimits the southwestern boundary of the FPA, except in the northwest, where approximately 0.75 $km^2$ of forested land on the south side of the highway is included in the FPA. Forested Crown Lands extend westward from the Deep Bay Waterworks District.

## COMMUNITY VALUES

Deep Bay Waterworks District is recognised as a "highly desirable and vibrant" community due to a variety of attributes: mild climate, special natural environment, outdoor recreational opportunities, water resources, entrepreneurial spirit, and progressive attitude (Official Community Plan, RDN Area H).

Pressure for change and development are inevitable, given the favourable attributes of the area. Values considered fundamental to the health and prosperity of the community, as outlined in the Official Community Plan for RDN's Area H, include:

- Protection of rural character and containment of urban development
- Identification and protection of watersheds and aquifers
- Protection/promotion of natural, environmental, and geographic features
- Support for development regulations to protect environmentally sensitive areas (including aquifer recharge areas)
- Promotion of inter-jurisdictional cooperation

The protection of environmentally sensitive areas (groundwater resources and aquifer recharge areas) in undeveloped forested areas with a high to extreme interface fire hazard is of significant concern to the Deep Bay Waterworks District.

New subdivision developments in high to extreme interface fire areas of RDN's Electoral Area H (including Deep Bay Waterworks District) are not required to implement specific mitigative measures to reduce the threat of interface fire. There are no Development Permit Areas for wildfires in the Official Community Plan. Building inspections are not conducted in Electoral Area H.

## ECONOMY

The economy of Deep Bay Waterworks District is primarily based on a small service industry. A small number of recreational vehicle parks, resort campgrounds, and bed-and-breakfasts cater to visitors (Photo 6). Tourist resorts are concentrated in a narrow area along the coast. A federal dock (managed by the Port Authority of Deep Bay) and private yacht club, sheltered by Mapleguard Spit, attract many small pleasure craft, especially in summer (Photos 6, 7). As many as 200 boats anchor at Deep Bay harbour in the summer. Saltwater sport fishing is an important recreational activity in the area.



Photos 6, 7. A sheltered harbour and saltwater sport fishing attract visitors to Deep Bay Waterworks District.

As noted earlier, Baynes Sound has been used for shellfish culture for many years. Malaspina University-College is currently building a shellfish research facility at the end of Crome Point Road. (The building contractor submitted an emergency fire plan to the Deep Bay Fire Chief; the development site is in a forested area not protected by fire hydrants).

There are no industrial sites at Deep Bay Waterworks District.

### ACCESS

Deep Bay Waterworks District is accessed by road from Highway 19 (main junctions are Gainsberg Road and Jamieson Road), and by sea at Deep Bay harbour (federal government wharf and private yacht club).

### WATER

Deep Bay Waterworks District maintains the water supply for the local community. Groundwater is derived from aquifers (Quadra Sands - commonly known as glacial till), distributed through the area, primarily in lowland areas near watercourses. The Quadra Sands retain water underground. The subsurface material, which supports groundwater aquifers, is extremely sensitive to disturbance and erosion. Surface water (including Gainsberg Swamp) and groundwater resources in the area are recognised as environmentally sensitive resources (OCP- Area H) (Figure 2).

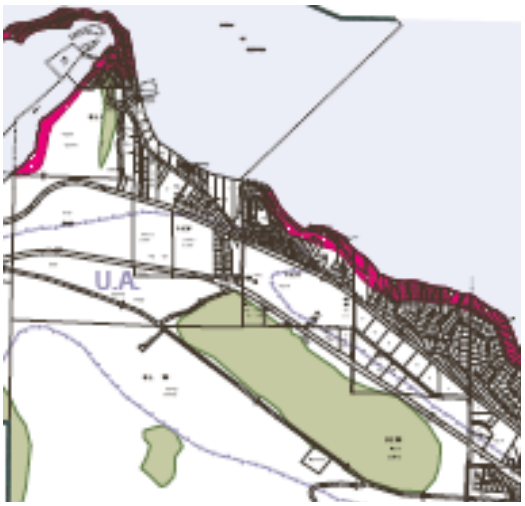



Figure 2. The Quadra Sands aquifers (green shaded area) are recognised as an environmentally sensitive area (ESA).

Water supply for Deep Bay Waterworks District is protected in a gated reservoir (two concrete tanks - each 60 000 gal) in a forested area of Crown Land southwest of Highway 19 (Photo 8). The Deep Bay Volunteer Fire Department conducts a weekly patrol of the reservoir throughout the year.

Photo 8. A gravel road off Highway 19 runs through a forested area containing Deep Bay Waterworks District's groundwater reserves.

Deep Bay Waterworks District is served by fire hydrants supplied by community water supply (Photo 9). There are currently 56 hydrants, with variable pressures (depending on the age of the hydrants).

Photo 9. Residential neighbourhoods at Deep Bay are serviced by fire hydrants.

Water pressure at individual residences at Deep Bay Waterworks District is excellent.

Deep Bay Waterworks District went to a metered water system in 2006 (Photo 10).

Photo 10. During the summer months, dry lawns are commonplace at Deep Bay Waterworks District.

**FIRE RISK**

Steady residential growth at Deep Bay Waterworks District and adjoining communities along the east coast of Vancouver Island is extending neighbourhoods into forested perimeters, placing undue pressures on small rural fire departments. The Deep Bay Volunteer Fire Department is concerned about the interface hazard in the local area and surrounding tenures, including forested lands west of Highway 19 that contain important aquifer and groundwater resources.

Unlike many other communities on southeast Vancouver Island, Deep Bay Waterworks District has no lakes or rivers to attract summer visitors (and consequently increase the fire hazard). As Fire Chief Jim Dennison notes, the high proportion of land base at Deep Bay Waterworks District devoted to residential use, combined with a lack of inland recreational sites, results in a low number of fire call outs. There is only one area of open beach in the community; limited public access to the coastline reduces the threat of escaped campfires.

In the last decade, the Deep Bay Volunteer Fire Department has responded to a relatively low number of fire calls. In recent years, the Fire Department has been called out to a boat fire (Deep Bay marina), occasional campfires (open area of beach at Shoreline), and a structure fire dangerously close to forest vegetation.

Photo 11. Forest vegetation dominates many residential areas at Deep Bay Waterworks District.

Fire Chief Jim Dennison of the Deep Bay Volunteer Fire Department admits, "it's fortunate his department has not been called out to respond to any significant interface fires". As the Fire Chief notes, however, other than at Mapleguard Spit (a low coastal spit), flammable forest cover in intermix and interface areas dominates Deep Bay Waterworks District (Photo 11). Forest cover occupies over 70% of the community. Considerable fuel loading (combustible and/or flammable vegetation and other materials) surrounds many residential structures, especially along forested border. Extensive forests surround Deep Bay Waterworks District. Extreme fire weather in recent summers aggravates the risk of fire.

# BIOPHYSICAL ATTRIBUTES

## CLIMATE AND BIOGEOCLIMATIC CLASSIFICATION

Climate affects vegetation structure, historical wildfires, and on a shorter time frame, fire danger.

Deep Bay Waterworks District lies in the rainshadow of the Vancouver Island Mountain Ranges (Photo 12), at the northern tip of the moist maritime Coastal Douglas-fir subzone (CDFmm), which extends along the southeast coast of Vancouver Island, inland to approximately 150 – 200 m above sea level (asl). The CDFmm represents the mildest climate in Canada. The CDFmm has warm, dry summers and mild, wet winters. Forests of the CDFmm feature Douglas-fir, together with western redcedar, and may include arbutus, Garry oak, and various deciduous species (i.e., broadleaf maple, red alder).

Photo 12. Deep Bay Waterworks District lies in the rainshadow of the Vancouver Island Mountain Ranges.

Western fringes of Deep Bay Waterworks District are located in the very dry maritime Coastal Western Hemlock subzone (CWHxm). The CWHxm has warm dry summers and moist mild winters.

Prevailing Pacific Coast weather systems at Deep Bay during the fire season (April to October) can vary from moderately moist (low to moderate fire hazard conditions) to windy and excessively dry patterns (high to extreme fire hazard conditions). Net radiation values are generally high, and moisture deficits are common in summer.

## FIRE HISTORY

For thousands of years prior to European settlement, infrequent fires swept through the Pacific Northwest (Table 1). Lightning sparked the majority of fires; others were set by aboriginal people cultivating plants for food and medicine. The result was a varied mosaic

of forest stands and habitats. Periodic low intensity surface fires reduced natural fuel loading and recycled nutrients.

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 | 150-350 | 350-500 | 0.1-5 | 50-500 | >500 |

(BC Ministry of Forests and Range)

In the last century, the demise of traditional aboriginal cultural land management practices, and the advance of modern fire suppression have produced a dramatic increase in natural fuel loading.

**PHYSIOGRAPHY AND SOILS**

Landforms and soils affect fire behaviour by affecting the type and growth rate of fuels (vegetation).

Deep Bay is located in the Nanaimo Lowland Ecosection, a coastal plain that fringes the south-eastern margin of Vancouver Island. Slopes at Deep Bay are generally less than 20%, although short steep slopes are found along the coast. Soils in the Deep Bay area have developed in fluvioglacial or marine deposits (Photo13). Drainage is variable. Typical soils include Dystric Brunisols, Duric Humo-Ferric Podzols, and Gleyed Humo-Ferric Podzols.

Photo 13. Deep fluvioglacial and marine deposits underlie much of Deep Bay Waterworks District.


## FIRE PROTECTION AND PREVENTION

The Deep Bay Volunteer Fire Department (DBVFD) provides service to the Deep Bay Fire Protection Area. The DBVFD is administered by the local Water Works board (it is not a Regional District fire department). Twenty-one volunteers currently serve on the department. The age range at the fire department is between 19 and 65 years, with the average age in the mid 50's. The DBVFD performs "Jaws of Life" service in addition to fire fighting duties.

Fire Chief Jim Dennison prides the "good respect" among volunteer fire fighters on the department, and notes "the crew is very stable". Unlike many other volunteer fire departments on Vancouver Island, the DBVFD has a wait list.

The Deep Bay Volunteer Fire Department operates under a mutual aid agreement with neighbouring fire departments. Mutual aid extends north to Cook Creek and south to Parksville (area wholly included within the Nanaimo Regional District). The DBVFD is pursuing mutual aid with the Fanny Bay Volunteer Fire Department (to the north). Fanny Bay lies in the Comox-Strathcona Regional District.


Photo 14. Deep Bay Volunteer Fire Hall.

The Deep Bay Volunteer Fire Department has adopted an effective proactive role in fire prevention. The fire department actively promotes fire prevention:

- Distribution of FireSmart pamphlets to local residents
- Maintenance of Fire Danger sign
- Participation in fire awareness program at local elementary school
- "Tailgate" discussions with residents
- Reviews fire services for lands being subdivided


Photo 15. Fire Danger sign at Deep Bay Waterworks District – A total burn ban was implemented during the Extreme Fire Danger weather in the summer of 2006.

## SECTION 3. PREPARATION OF THE COMMUNITY WILDFIRE PROTECTION PLAN

Development of the Community Wildfire Protection Plan for Deep Bay Waterworks District followed basic steps found in FireSmart (*FireSmart: Protecting Your Community from Wildfire*, Partners in Protection, 2003).

**STEP ONE:** Plan Overview – Objectives and Goals

Support for the project was readily garnered from the Deep Bay Waterworks District, the Deep Bay Volunteer Fire Department, the Ministry of Forests and Range, and the Regional District of Nanaimo. Preliminary planning meetings were held at Deep Bay Waterworks District office to establish overview goals.

**STEP TWO:** Data Acquisition and Information Sharing

Information and data was obtained in order to share perspectives, priorities, and other information relevant to the planning process.
The intent was to integrate information and resources.

Several community-planning guides and resources were used:

- *FireSmart – Protecting Your Community from Wildfire* (2nd Edition, Partners in Protection, 2003)
- *Firestorm 2003 Provincial Review*
- *Addressing the Interface Fire Hazard – A Case Study of the District of Langford* (District of Langford, 2002)
- *Water Supply for Public Fire Protection (*Fire Underwriters Survey, 1999*)*
- *National Fire Protection Association (NFPA) Standards* (NFPA, Massachusetts, US*A)*
- *OCP – Area H – Regional District of Nanaimo*

**STEP THREE:** Hazard - Risk Assessment

A range of factors were considered in the choice of models to evaluate interface hazard and risk:

- Fuel types and fire behaviour
- History of wildfire occurrence
- Structures, features, and essential infrastructure at risk
- Other community values at risk
- Local preparedness and firefighting capability

Hazard-risk models were selected for this project:

- Canadian Forest Fire Danger Rating System
- Community Interface Fire Hazard Assessment
- Hazard-Impact-Risk-Vulnerability Assessment

(Strategic Threat Analysis [STA] mapping, a recent introduction to BC fire prediction modeling, was not used due to its limited applicability to Vancouver Island.)

**STEP FOUR:** Base Hazard Mapping

Interface hazard mapping was developed in order to identify:

- Areas at potential risk from wildland fire
- A designation of the community's wildland-urban interface zone

The Regional District of Nanaimo provided base mapping (topographic, cadastral, and ortho) for field work. Pre-mapping was confirmed with ground truthing of lands in and adjacent to Deep Bay Waterworks District. Final mapping information was converted to digital format (GIS).

**STEP FIVE:** Community Hazard Reduction Priorities

Once the community assessment and base map were completed, local protection and hazard mitigation needs were analysed. Strategies to improve emergency preparedness and fire response capability were devised.

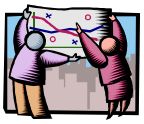
**STEP SIX:** Action Plan

Mitigation measures were identified in an action plan.

**STEP SEVEN:** Education and Awareness

The process of developing a CWPP 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.

**STEP EIGHT:** Implementation



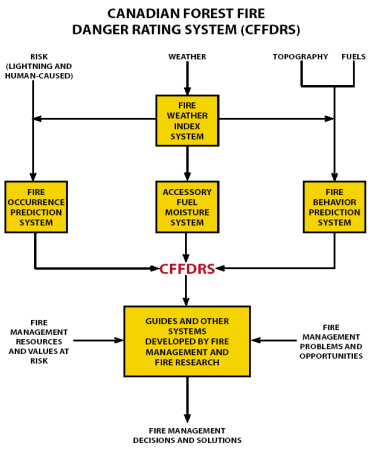
Stakeholders should reconvene annually to mutually agree on fuels treatment priorities, preferred methods for fuels treatment projects, equipment needs, and other necessary actions. The Regional District of Nanaimo should establish an assessment strategy for the CWPP to ensure the plan maintains its relevance and effectiveness over the long term.

# SECTION 4: HAZARD-RISK ASSESSMENT

## HAZARD ASSESSMENT METHODOLOGY

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

- The **Canadian Forest Fire Danger Rating System** (CFFDRS) – used to evaluate daily forest fire danger




- **Interface Community Fire Hazard analysis** – based on FireSmart - provides a quantitative procedure for assessing the interface fire hazard


- **Hazard, Impact, Risk and Vulnerability (HIRV) model** – a community risk assessment used to evaluate:
  - Hazard Identification
  - Risk Analysis
  - Vulnerability Assessment
  - Impact Analysis
  - Risk Management

**Canadian Forest Fire Danger Rating System**: Developed by Forestry Canada, the CFFDRS comprises two major subsystems: the Fire Weather Index (FWI) system and the Fire Behaviour Prediction (FBP) system.

The Fire Weather Index system accounts for the effects of fuel moisture and wind on ignition potential and probable fire behaviour.

The Fire Behaviour Prediction System predicts the rate of spread, fuel consumption, and intensity of wildfires. Fire behaviour is affected by prevailing weather severity, fuel type, slope steepness, geographic location, elevation, and calendar date. Fire behaviour influences both the extent of resource damage and the success of any suppression action.

Fuel types constitute the basis of fire behaviour predictions. Any substance that will ignite and combust is a fuel. The FBP System provides quantitative outputs of fire behaviour characteristics for natural fuel types (fuel complexes of sufficient homogeneity and extending over an area of sufficient size that equilibrium fire behaviour can be maintained over a considerable time period).

The Ministry of Forests and Range classifies forest fuels into three vertical layers: ground fuels (all combustible materials in the organic duff layer and on the forest floor – i.e., twigs, leaves, dry or cured grasses, shrubs); surface fuels (or ladder fuels = fuels that provide vertical continuity between the ground and the tree canopy, allowing a fire to move up into the tops of trees, where a fire is harder to contain); and crown fuels (standing and supported forest fuels not in contact with the ground – includes leaning deadfall, higher branches).

Daily weather readings are recorded as part of the Fire Behaviour Prediction system to calculate Fire Danger Class (DGR) (Tables 2, 3).

**Table 2. Fire Danger Class (DGR)**

| ***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 (potential fire intensity); BUI = Buildup Index (total amount of fuel available for combustion)

| | | |
|---|---|---|
| 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 3. Fire Danger Rating

| Rating | Description |
|---|---|
| Class 1 | Forest fire not likely to start. (**VERY LOW**) |
| Class 2 | Danger is **LOW**. Fires could start in light flashy fuels, but will have a slow rate of spread. |
| Class 3 | Fire danger is **MODERATE.** Fires started in fine fuels in open areas and sunny slopes may spread rapidly. |
| Class 4 | Fire danger is **HIGH**. Fires will start easily from all causes, will spread rapidly, and increase in intensity rapidly - they will be hard to extinguish. Spot fires may occur and will burn deep. |
| Class 5 | Danger is **EXTREME**. Small fires will spread very rapidly - and will be hard to extinguish. Severe spotting may occur. Mop-up will require a great deal of effort. |

Over the last decade, local fire weather data from the Ministry of Forests and Range Coastal Fire Centre indicates long periods of days in Fire Class Hazard 3 (moderate danger class) or higher.

**Interface Community Fire Hazard Analysis:** The Ministry of Forests and Range Protection Branch "Interface Community Fire Hazard" analysis (adopted from FireSmart; customised for use on the BC south coast) provides a quantitative procedure for assessing the interface fire hazard. Over twenty-five risk factors are rated (i.e., fuel types; potential fire behavior; structures at risk; susceptibility to ignition; suppression constraints; general location; fire history; type of development; access; above-ground utility corridors; tenure; developed recreation sites; watersheds; wildlife habitat; cultural features).

The Interface Community Fire Hazard analysis assigns points – the greater the hazard, the greater the number of points – to each hazard-risk factor. Hazard categories are low, moderate, high, and extreme. An interface area, site, or structure is not considered to be "fire safe" unless it obtains a low or moderate assessment score.

**Hazard, Impact, Risk and Vulnerability (HIRV) Process:** Risk assessments allow communities to anticipate and reduce the impacts of natural and manmade hazards by using data and information resources.

Hazard and risk factors identified in the CFFDRS and Interface Community Fire Hazard analyses were incorporated in the Hazard, Impact, Risk and Vulnerability model.

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 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. Table 4 compares probability of ignition at common locations.

Table 4. Probability 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 50 m of housing | High |

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 the use of social factors, environmental factors, and political factors. Impact analysis provides the necessary links between vulnerabilities and hazards.

## SECTION 5: FUEL AND ITS IMPACT

### FUEL TYPES AND FIRE BEHAVIOUR

The Canadian Forest Fire Danger Rating System and the Interface Community Fire Hazard Analysis were used to identify major fuel types and potential effects on fire behaviour at Deep Bay Waterworks District (Table 5). It is important to note, that, of the three factors influencing fire behaviour – fuel, weather, and topography – only fuel can be modified.

**Table 5. Fuel Types at Deep Bay Waterworks District**

| | Fuel Characteristics | | | |
|---|---|---|---|---|
| Layer: / Fuel Type Complex: | **Forest Floor and Organic Layer** | **Surface and Ladder Fuels** | **Stand Structure and Composition** | **Comments -General Location/ Hazard/ Mitigation** |
| **Coniferous (Douglas-fir dominated) natural/planted stands – varying ages** | Moderately shallow to shallow forest floor comprised of twigs, needles, feather moss. | Herb layer variable; Shrub layer gen. dominant (i.e., salal, Oregon grape, ocean spray, red huckleberry, Rubus spp.); Surface loading gen. high (logs, branches, etc.) Ladder fuels (shrub layer + live/dead branches) often continuous from ground to lower crowns. | Stocking is generally moderately dense to dense. Canopy closure generally > 70%. Fd(CwHw) | Generally located west of Highway 19; High Interface Hazard |
| **Affect on fire behaviour:** | High capability of carrying surface fire | High capability of carrying surface fire into crowns | Higher likelihood of crown fires developing in denser stands. | Assess stands nr local water supply areas for fuel reduction treatment. |
| **Mixed coniferous (Douglas-fir/pine) stands** | Continuous needle litter; shallow to mod. shallow organic layer | Herb layer variable Shrub layer generally dominant (i.e., salal, Oregon grape, ocean spray, Rubus spp.); Surface fuel loading mod - high. Conifer crowns often extend nearly to ground. | Stocking is generally dense. Canopy closure generally > 80%. FdPl | Small stands generally located W of Hiway 19; High Interface hazard – but limited distribution |

| | | | | |
|---|---|---|---|---|
| **Affect on fire behaviour:** | High capability of carrying surface fire | High capability of carrying surface fire into crowns | Crown fires have higher likelihood of developing in denser stands. | Small stands – possible future fuel treatment |
| **Mixed wood stands (coniferous/deciduous) – varying ages** | Shallow, friable forest floor comprised of leaf and needle litter. | Herb layer often dense; Shrub layer discontinuous to continuous; Surface fuel loading variable; Ladder fuels may be continuous from ground to lower crowns. | Moderately well-stocked stands with variable deciduous component FdCwHw (Mb,Dr,Act) | Generally distributed in moister locations throughout area; Moderate Interface Hazard |
| **Affect on fire behaviour:** | Low to mod. capability of carrying surface fire | Low to mod capability of carrying surface fire into crowns (risk increases during extreme fire weather, when deciduous leaves dry out). | Crown fires are generally unlikely, except during extreme fire weather. | Fuel mitigation generally not required; deciduous compon-ent of stands slows fire spread. |
| **Slash** | Range of fuel sizes. Cedar content increases flammability. | Not applicable | Not applicable | Localised; scattered locations - variable hazard |
| **Affect on fire behaviour:** | High risk of ignition and spread in recent slash (< 1 yr old) during extreme fire weather | | | Ensure slash is abated expedien-tly in envir-onmentally sound manner. |
| **Unnatural Fuel Types (human structure and facilities)** | Residences (various construction materials), businesses, resorts, institutions (elementary school) | | | Mainly nr coast - some intermix areas in W |
| **Affect on fire behaviour:** | Structures constructed with flammable materials (combustible roof-covering assemblies and non fire-resistant siding), surrounded by forest cover are at greatest risk from interface fire. | | | Establish/ maintain FireSmart Fuel Modifica-tion Zones around structures. |

**THE IMPACT - HAZARD AND RISK ANALYSIS**

A Hazard-Impact-Risk-Vulnerability (HIRV) model was developed to demonstrate the potential impact of interface fire at Deep Bay Waterworks District at the height of the summer fire season (Table 5).

**Table 5.**

**Hazard Impact Risk and Vulnerability Model. Interface Fire Hazard – Midsummer Deep Bay Waterworks District.**

| Hazard | Risk Rating | Certainty | Vulnerability Rating | Certainty | Impact Analysis* | Certainty | Risk and Vulnerability Analysis |
|---|---|---|---|---|---|---|---|
| Interface/ Wildfire- Deep Bay Waterworks District | High to Extreme | Data is well established | High to Extreme | Data is well establish'd | Env=3 Soc=2 Econ=2 Pol=1-2 | Data is well established | Risk=Extreme Vulnerability= High to Extreme |

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

The vast majority of wildfires in BC, particularly on the southeast coast, are caused by humans. The probability of a wildfire at Deep Bay Waterworks District is highest in areas of human habitation and activities (i.e., residential areas bordering forest fuels).

## SECTION 6. WILDLAND URBAN INTERFACE HAZARD MAPPING

Deep Bay Waterworks District was stratified into areas with similar interface characteristics in order to develop interface hazard mapping. Hazard-risk models were incorporated in hazard mapping. A wide array of interface factors were considered: fuel types, fuel loading, fire history, aspect, topography, type of development, access, above-ground utility corridors, private land with structures, timber areas, developed recreation sites, watersheds, wildlife habitat, and cultural features.

Interface areas were mapped using four standard Ministry of Forests and Range hazard mapping classes (Table 6, Figure 3).

Areas at **LOW** risk for interface fire may have some or all of the following characteristics:

- urban, suburban, and farm areas with modified forest fuels
- superior fire protection coverage with fast response times
- good 2-way access and good fireflow
- low readily combustible natural fuel (i.e., insignificant forest/grassland cover)
- gentle topography
- minimal history of interface fires
- significant area of wetland vegetation
- low risk to adjacent development

Example: residential area at eastern end of Mapleguard Spit

Areas at **MODERATE** risk for interface may have some or all of the following characteristics:

- good fire protection coverage with acceptable response time
- scattered mixed forest in suburban setting
- partially modified forest fuels; moderate fuel loading
- gentle to sloping topography
- periodic fire starts
- 2-way access; moderate to good water availability for fireflow
- homes and structures could be threatened by interface fire

Example: residential areas at eastern ends of Jamieson and Gainsberg Roads

Areas at a **HIGH** risk for interface fire may have some or all of the following characteristics:

- delayed fire protection coverage, or no fire protection
- areas with little or no vegetative fuel modification; high fuel loading
- moderately to steeply sloping topography
- some areas hard to access
- moderate to low availability of water for fireflow
- frequent fire starts
- combustible structures
- suppression may be difficult

Example: forested lands bordering many residential areas at Deep Bay Waterworks District

Areas at **EXTREME** risk from interface fire may have some or all of the following characteristics:

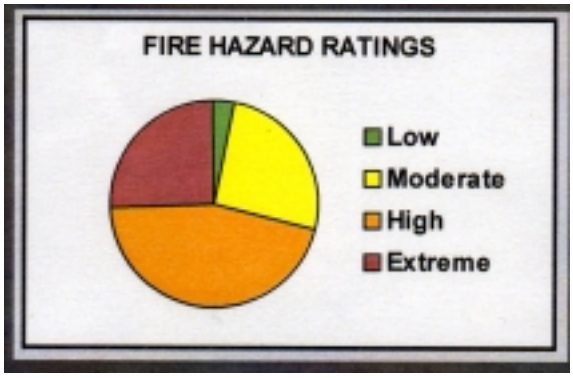
- outside fire protection boundaries
- little or no fuel modification
- continuous ground fuels; high to very high vegetative fuel loading
- rugged topography
- very poor access for conventional fire fighting equipment; some areas inaccessible
- a lack of standard fireflow
- infrequent to frequent fire starts
- significant proportion of highly combustible structures
- may have heavy use areas
- direct threat to homes and structures

Example: forested lands west of Highway 19

Table 6.

| | **Interface Fire Hazard Ratings – Deep Bay Waterworks District** |
|---|---|
| **Low** | 4% |
| **Moderate** | 25% |
| **High** | 45% |
| **Extreme** | 26% |

Figure 3. Deep Bay Waterworks District - Interface Fire Hazard Ratings




Interface fire hazard ratings at Deep Bay Waterworks District range from Low (built-up residential areas along the coast - significant fuel modification) to Moderate (residential areas with varying degrees of fuel modification), to High (rural residential interface and intermix areas bordering extensive forest) and Extreme (continuous forest stands in western portion of district).

## SECTION 7: MITIGATIVE ACTIONS – A DISCUSSION

The danger of interface fire is inevitable. Despite determined efforts at fire prevention and protection, interface incidents throughout the province are becoming more common. The majority of fires in BC are human-caused. Fires can be anticipated on southeast Vancouver Island at any time of year - the risk rises from early spring to late fall. Scientists are predicting longer fire seasons as a result of global warming and climate change. The risk of interface fire is highest during extended warm dry periods in the summer.

As people continue to seek out natural settings in which to live, there is little doubt that one day fire will intrude. It is not a question of "if" fire will occur, but when and where.

Approximately 80% of the Deep Bay Waterworks District has a high to extreme risk of interface fire. The Deep Bay Waterworks District and Deep Bay Volunteer Fire Department have been instrumental in fire protection and prevention efforts. As population pressures push neighbourhoods and human activities further into forested areas, fire assumes a greater risk. A concentrated effort by community partners – Deep Bay Waterworks District, Deep Bay Volunteer Fire Department, and regional and provincial governments – is essential to ongoing interface fire prevention at Deep Bay Waterworks District.

Mitigative actions to reduce the interface fire hazard should involve:

- Education and Public Awareness – Effective communication is the crucial key to preventing or minimising fire risk in the wildland-urban interface. Community support is dependent upon cooperation from stakeholders, all levels of government, and the public and private sectors.

- Vegetation Management – Establish and maintain FireSmart fuel modified areas around interface structures and key resources (see FireSmart, 2nd Edition, 2003).

- Structural Design and Construction – The safety of buildings in the interface zone must be addressed. The ability to educate future homeowners in designing homes in high hazard-risk interface areas – i.e., through the use of non-combustible roof covering assemblies and fire-resistant siding materials – would help mitigate the interface fire hazard. As an Improvement District, the Deep Bay Waterworks District basically has no means of regulating structural design and construction.

- Infrastructure – Infrastructure includes local services, and planning tools available to local government to protect life and property in the interface.

## SECTION 8: EXECUTIVE SUMMARY – ACTION PLAN

Mitigative action is primarily a responsibility of the community. Deep Bay Waterworks District has taken an important initiative to identify the interface fire hazard in the local community. The Deep Bay Waterworks District and Deep Bay Volunteer Fire Department, in concert with the Regional District of Nanaimo and Ministry of Forests and Range, should be encouraged to develop and implement risk reduction strategies and policies.

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

Government planning tools can be used to develop various mitigative strategies, and to ensure mitigation is carried out on a long-term basis.

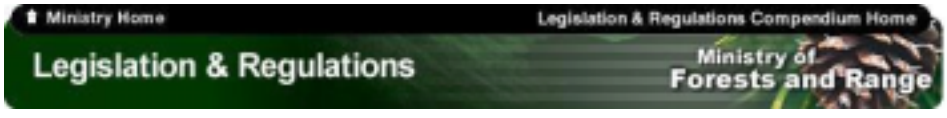
The following recommendations are aimed at reducing the risk of interface fire at the Deep Bay Waterworks District:

**Education and Community Involvement:**

- **Strive to involve homeowners and the public – including summer visitors – in interface issues through an effective education and public awareness program.**


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

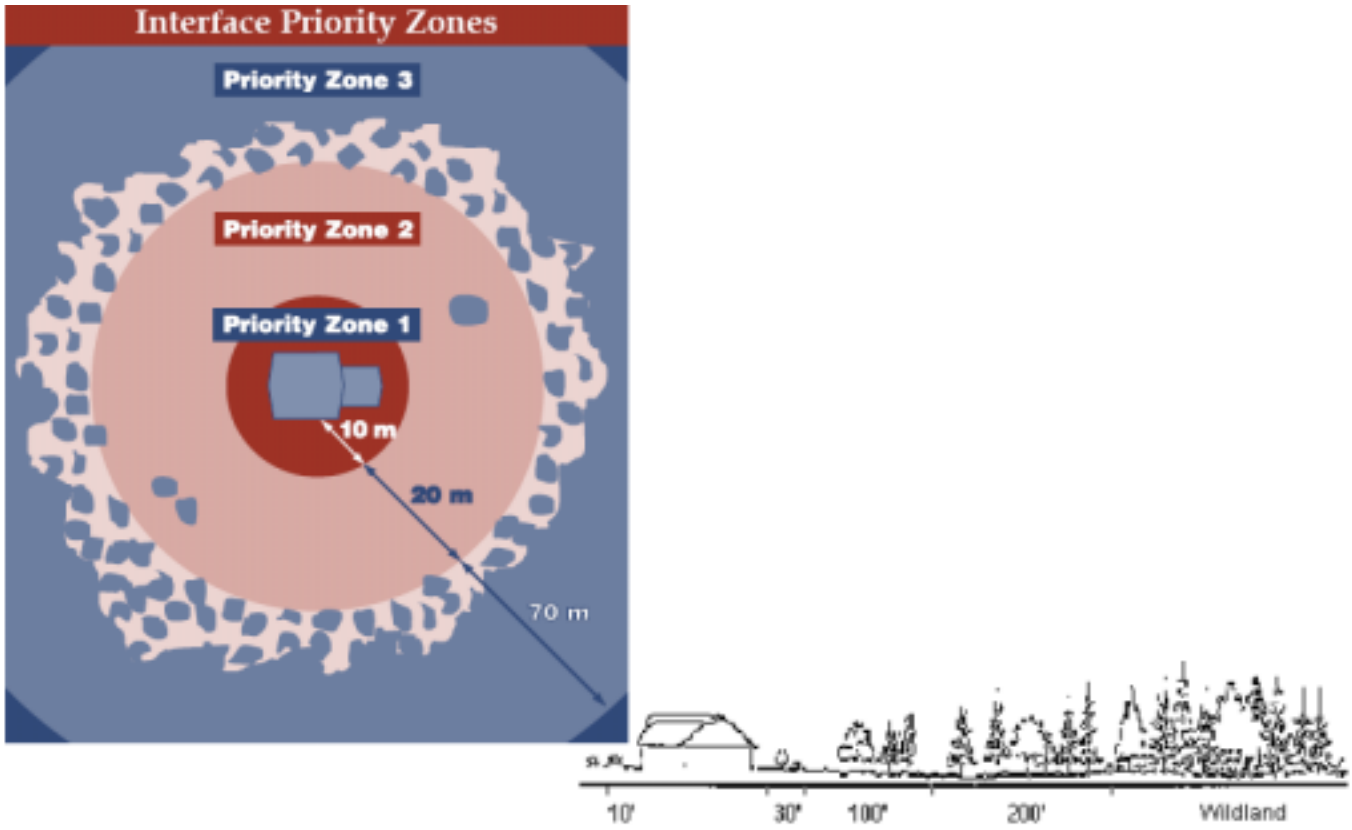

- **Ensure resorts are familiarised with pertinent sections of BC's new Wildfire Act (SBC 2004) – including forest fire protection and campfire restrictions.**



**Vegetation Management:**

Fuel Modification Areas –

- **Encourage home and property owners to establish and maintain Fuel Modification Zones around structures.**




- **Now that water metering is in effect, residents should be encouraged to regularly cut tall dry grass around their residences, especially during long periods of summer drought.**

- **Cooperate with local First Nations groups to minimise the threat of fire in flammable vegetation at protected archaeological sites.**

- **Maintain the integrity of vegetation in and surrounding environmentally sensitive water resource supply areas.**

- **Review the ability to conduct a pilot fuel treatment project (possibly funded through UBCM) to reduce hazardous forest fuel loading in critical groundwater supply areas (environmentally sensitive areas).**

Fire-resistive Vegetation –

- **Encourage residents to landscape with fire-resistive vegetation.**
  ***See FireSmart Landscaping on Southeastern Vancouver Island* (brochure included*), Strathcona Forestry Consulting, 2004**
  **http://www.district.langford.bc.ca/document/brochures/FireSmartLandscaping.pdf**

Fuel Disposal –

- **Encourage homeowners to compost deciduous litter and grass clippings.**

- **Investigate with the Regional District of Nanaimo the feasibility of a bylaw to license the disposal of land clearing debris in machine stacked piles (to be taken to a licensed disposal facility, or burned onsite using air curtain burners, or chipped onsite).**

**Infrastructure:**

Strategic Planning –

- **For areas that are designated for future development in the OCP (that is, not already zoned for development), ensure that the secondary plans or bylaw amendment applications contain development permit areas for interface fire risk mitigation. Request to the Regional District of Nanaimo that development permit areas be applied to existing developed/subdivided areas in high or extreme interface hazard areas.**

- **Work closely with the Regional District of Nanaimo in the rezoning applications of any undeveloped lands within the district to ensure that servicing requirements for water and fire protection are met.**

- **Issue FireSmart pamphlets to development applicants.**

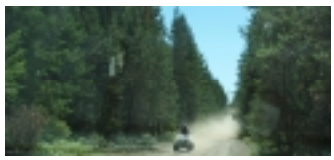
- **Continue to regulate by bylaw the provision of works and services to lands that are being subdivided in order to provide consistent standards for access and water service.**

- **Continue the practice of distributing FireSmart pamphlets to home and property owners.**

- **In the interest of inter-jurisdictional cooperation, continue to pursue a mutual aid agreement with Fanny Bay Fire Department (Comox-Strathcona Regional District).**

Forest Watch -

- **Continue the practice of regularly conducting fire department patrols of the forested lands west of Highway 19.**



- **Encourage residents to institute "Forest Watch" patrols during fire season. Promote "Forest Watch" patrols in the local newsletter.**

Access -

- **Continue to ensure roads and driveways are maintained for emergency access.**

- **Continue to refer any development applications for water service to the Deep Bay Volunteer Fire Department for review to ensure that access to the future residence is sufficient to allow fire trucks access to the property. The requirements for driveways and accesses are clearly outlined in the FireSmart manual.**

Firefighting at the Grassroots Level –

- **Encourage homeowners bordering areas of extensive forest to equip homes with personnel fire fighting equipment, including: rooftop access ladder, shovel, rake, large water barrel, and 10-L pail.**

## SECTION 9: IMPLEMENTATION

No plan is complete until it is implemented.

The board of trustees of the Deep Bay Waterworks District must take the responsibility for implementation of the Community Wildfire Protection Plan by working with senior levels of government.

The recommendations contained in this Community Wildfire Protection Plan should be reviewed following adoption of the plan. Maintenance of the CWPP should include an annual schedule for monitoring and evaluating the programmatic outcomes established in the Plan. A thorough review should also take place at five years.

Regular evaluations of the CWPP should 1) assess the effectiveness of programs, and 2) identify any changes in hazard-risk assessments.

Fire protection and prevention in the interface is an ongoing process for the Deep Bay Waterworks District and the residents it serves.