# FireSmart

## Protecting Your Community from Wildfire

**Working Together for Safer Communities in the Wildland / Urban Interface**

# FireSmart

# Protecting Your Community from Wildfire



PARTNERS IN PROTECTION

SECOND EDITION

*Second Printing*

## Abstract

The wildland/urban interface is any area where industrial or agricultural installations, recreational developments, or homes are mingled with flammable natural vegetation. This illustrated guide focuses on how individuals and communities can work together to reduce the risk of loss from interface fires in Canada. It provides practical tools and information for use by interface residents, municipal officials, land use planners, structural and wildland firefighters, and industries that operate in the wildland/urban interface. Primary topics include a description of interface issues, evaluation of interface hazards, mitigation strategies and techniques, emergency response for agencies and individuals, training for interface firefighters, community education programs, and regional planning solutions. *FireSmart: Protecting Your Community from Wildfire* was produced by Partners in Protection, an Alberta-based coalition of professionals representing national, provincial and municipal associations and government departments responsible for emergency services, land-use planning, and forest and resource research and management. FireSmart is based on the best available scientific information at time of publication. Research in this area is ongoing.

## Résumé

Les zones d'interaction villes–milieux naturels désignent tout endroit où l'on retrouve des installations industrielles ou agricoles, des établissements récréatifs ou des habitations situés près d'une végétation naturelle inflammable. Ce guide illustré a été conçu afin d'enseigner aux gens et aux agglomérations à travailler de concert afin de réduire les risques liés aux feux dans ces zones au Canada. Le présent ouvrage propose des conseils pratiques et des informations pour les résidents de ces zones à risque, les intervenants municipaux, les gestionnaires du territoire, les pompiers qui combattent les feux de végétation et les industries qui gravitent autour des dites zones. Les principaux thèmes développés sont la description des enjeux et l'évaluation des dangers dans ces zones, les lignes directrices recommandées pour réduire les pertes associées aux feux, l'intervention par les sociétés de protection et les particuliers, la formation des pompiers, les programmes éducatifs communautaires et, finalement, les solutions de planification régionale. *FireSmart: Protecting Your Community from Wildfire* a été réalisé par 'Partners in Protection', un regroupement de professionnels de l'Alberta, représenté par des membres d'associations nationales, provinciales et munici-pales, et de départements gouvernementaux responsables des services d'urgence, de la gestion des forêts et des parcs et de la gestion du territoire. FireSmart s'appuit sur les meilleures informations scientifiques disponibles au moment de la publication. La recherche dans ce domaine est encore en évolution.

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# Foreword

Many years ago, early in my career, I stopped to issue a fire permit to a lady whose farm was on the edge of an old burn. It was early spring, and she had been piling yard debris from the old burn by hand. As I was writing the permit, she gazed across her yard towards the river valley and started talking about the fire that had burned over her property nine years earlier.

As she spoke, I realized that she was reliving the event. She described the thick, rolling, black smoke, and seeing fire spotting across the valley. Several hours later, she recalled, the fire was roaring unabated towards them. The sky was dark from the smoke, even though it was mid-day and flames were licking their property.

She described how they managed to get their livestock out and gathered a few things before they left in a swirl of hot ash and embers. When the family returned in dread a few days later, nothing was left. The fire had taken everything. Equipment, fences, buildings, seed, forage, their home, and even their kids' bicycles had burned. Nine years later, they were still rebuilding. As she took the permit from my hand, she looked across the valley of fire-killed trees and quietly said, "It was so beautiful…"

The impact of wildfire is devastating and long-term. Some people never really recover from its effects. Wildfire does not recognize jurisdictional or political boundaries, does not care if you are wealthy or poor, and does not wait until you have resolved interagency differences or until your response training is completed and your equipment is ready.

Wildfire responds quickly to fuels whether they are in the forest, in your community, or in your yard. It burns flammable grasses, shrubs, brush, trees, and—if given the chance—our homes. Wildfire can devastate communities and reduce dreams to ashes.

It is critical that we recognize that fire is part of the natural ecosystems that we are building in, that fire has occurred there in the past, and will occur again in the future. We can no longer wait and expect that fire departments or wildfire agencies will simply protect our communities. This does not mean that we can't live in or near interface areas. If we plan our communities and build our homes with the threat of wildfire as a key consideration, we can significantly reduce the risk that wildfire poses.

To make a community FireSmart takes more than a single project, initiative or effort. More often, making a community FireSmart involves a series of projects by individuals, groups, or agencies.

It is not a one-time campaign, either. It takes a continuous effort by all who have a stake in the community or could be affected by wildfire.

Municipal bylaws and architectural standards that discourage the use of flammable building materials, and the work of municipal planners, homeowners and others all contribute to create effective FireSmart communities.

Many hands do make light work. We all have a responsibility when it comes to the wildland/urban interface. That includes homeowners, municipal planners and authorities, developers, fire suppression personnel and many others. Now is the time to reduce the threat of wildfire to your homes and communities, not when the fire is at your doorsteps.

Be proactive, be practical, and be FireSmart!


Rick Arthur
President
Partners in Protection
May, 2003

# INTRODUCTION

Whenever residential, industrial, or agricultural developments are located within or near wildland settings with natural vegetation, they are at risk from wildfire. We call such areas the wildland/urban interface, or interface for short. Fires that have the potential to involve buildings and wildland fuels or vegetation simultaneously are known as interface fires. An interface fire can ignite within a building and spread to nearby forests or, more commonly, spread from burning vegetation to engulf homes, farms, or industrial installations.

Forested and wildland areas are highly desirable places to live. What makes them so attractive, however, also makes them hazardous. While vegetation is an amenity for residents, it is nothing more than a source of fuel for a fire.

The economic and social impact of interface fires is immense. Every year, tens of thousands of Canadians are placed on evacuation notice or evacuated from their homes and places of work because of the risk of wildfire. Wildland/urban interface fires can occur at almost any time of year.

Prevention and control of interface fires presents many unique challenges. These challenges demand that communities take collective responsibility for the problem, and that we develop new attitudes towards fire. All members of the community need to cooperate to implement novel approaches that resolve fire problems in the wildland/urban interface.

The lives of people who live in the wildland/urban interface are often deeply intertwined with nature. People live in the interface for recreation or escape from the urban setting, or because their livelihood depends on agriculture, tourism or resource-based industry. Others carry on their traditional aboriginal lifestyles and culture.

The forest, parkland, and agricultural landscapes of Canada are now scattered with subdivisions, settlements, campgrounds, ranches, lodges, industrial sites, and homes that are vulnerable to wildfire. The number of wildland/urban interface areas is growing rapidly in Canada.

The danger of interface fire has been known for many years. Despite many determined efforts to resolve the problem, incidents continue to become more common and increase in terms of economic, societal, and personal impacts.

## The Risk of Wildfire in the Wildland / Urban Interface

The interface fire problem continues to grow for a number of reasons:

- Residents and others in the interface may not be aware of, or do not fully appreciate the interface fire danger and the possible consequences.
- They may also have a false sense of security about protection from interface fire, or feel that it is the responsibility of their local fire department or provincial/territorial agency.
- Others may be concerned about interface fire but do not know how to reduce the risk without sacrificing the natural setting or visual attractiveness of the area.
- Within many interface areas, the net effect of many years of successful fire suppression has been to increase the amount and continuity of fuels available to future fires.

To reduce the risk of wildfire losses, we must all be more aware of the potential consequences of interface fire and share responsibility to find practical solutions.



PHOTO: BRIAN MOTTUS

The threat of wildfire must also be seen at a broader landscape level. Fire has been a major factor in shaping the vegetative cover and creating a mosaic across the forest landscape. In many cases, large-scale fire events have repeatedly occurred across the landscape. To reduce the threat of a large intense wildfire to a community, the forest fuels must be

assessed well back from the community. Efforts to make communities FireSmart may be compromised if the landscape surrounding the community is not also FireSmart.

### Be FireSmart – Protect Your Community from Wildfire

Partners in Protection is an Alberta-based non-profit organization that formed in 1990 to address common issues in the wildland/urban interface.

We originally developed this manual, *FireSmart: Protecting Your Community from Wildfire*, to give communities and individuals across Canada the information and tools they need to confront interface fire protection issues. The second edition updates the original and presents more recent examples of FireSmart initiatives. It also reflects current perspectives on fire prevention and intervention in the wildland/urban interface.

Communities benefit when they adopt programs of interface fire awareness and work together on effective preventive solutions. As well as providing greater safety for people, homes and businesses, communities can expect decreased fire-fighting costs and better protection for adjacent natural resources like forests and rangeland.

### How to Use the FireSmart Manual

Partners in Protection encourages community-based initiatives to reduce the risk of fire losses and enhance safety in the wildland/urban interface. Partners in Protection is recommending a three-phase program for use by interface fire community members in resolving their fire problems. This is the focus of the remainder of this manual.

#### Theme 1: Assess the situation

- **Chapter 1:** The Issues
- **Chapter 2:** Wildfire Hazard Assessment System

#### Theme 2: Resolve existing problems

- **Chapter 3:** Solutions and Mitigation

## WHO IS THE FIRESMART MANUAL FOR?

*The FireSmart manual is written for:*

- Property owners and residents
- Fire chiefs and fire department personnel
- Municipal and wildland fire protection personnel
- Other emergency services personnel
- Municipal planners
- Developers, building contractors, and building material manufacturers
- Elected officials and councillors
- Insurance industry representatives
- Utility company representatives

#### Theme 3: Avoid future problems

- **Chapter 4:** Emergency Measures
- **Chapter 5:** Wildland/Urban Interface Training
- **Chapter 6:** Communications and Public Education
- **Chapter 7:** Land Use Planning
- **Chapter 8:** Communities Taking Action — *Templates for Success*

We hope that residents and others interested in the wildland/urban interface will find *FireSmart: Protecting Your Community from Wildfire* helpful. For more information about wildland/urban interface fire prevention, contact your nearest fire authority.

# The Issues

CHAPTER ONE *provides users with some background information on the risk of wildfire in the wildland/urban interface, what is at stake, and who shares responsibility for action.*

# WILDLAND/URBAN INTERFACE FIRE: BACKGROUND

## What Is the Wildland/Urban Interface?

Wildland/urban interface areas exist wherever homes and businesses are built among trees and other combustible vegetation. There are interface communities all over Canada, in both remote rural locations and in urban centres. The thousands of remote villages and natural-resource-based communities that dot Canada's northern areas are wildland/urban interfaces, too.

The advantages of interface living have resulted in a significant population growth in the wildland/urban interface. These areas offer natural scenic beauty and a more relaxed lifestyle.

## How Does Fire Threaten the Wildland/Urban Interface?

The wildland/urban interface fire problem stems from two different sources of fire and their impact on the community. Fires can move from forest, bush, or grassland areas into the community or from the community into adjacent wildlands.

## Wildfires that start in the forest and spread into the interface community

Fire is a natural element in any forest, grassland, or wildland. When uncontrolled fire burns intensely in the forest and vegetation adjacent to interface homes, resident safety is threatened and combustible buildings may be burned.

## Fires that start within the community and spread into adjacent wildland areas

Fire from burning buildings or such activities as garbage incineration can spread away from communities to damage commercial forests and threaten resource-based industries and parks.

Providing effective fire protection to the interface community is one of the greatest challenges facing fire officials.

# WHAT DOES WILDLAND/URBAN INTERFACE MEAN?

The term **wildland/urban interface** describes any area where combustible wildland fuels are found adjacent to homes, farm structures, and other outbuildings. This may occur at the **interface**, where development and wildland fuels (vegetation) meet at a well-defined boundary, or in the **intermix**, where development and wildland fuels intermingle with no clearly defined boundary.

**1** The interface area is the first wave of buildings adjacent to dense wildland vegetation.

**2** The intermix areas show as individual homes or pockets of buildings surrounded by wildland fuels (forest, brush, or grasslands).

**3** Even in urban areas some distance from the interface, structures can be at risk when wind carries showers of embers from wildfires.

# Interface Case Studies – Salmon Arm



PHOTO: TONY FALCAO

Heavy quantities of beetle-killed trees and steep terrain around the actual fire, combined with the hot dry weather, prevented firefighters from gaining safe access to many areas of the fire.

Air tankers had trouble dropping retardant accurately in steep canyons and were further aggravated by strong gusty winds - this added to suppression difficulties for the ground firefighters. Total fire size by August 5 was 450 hectares, but by that afternoon, the fire had blown up, increasing in size to over 6,000 hectares. Embers caught in the strong winds carried flames into the Silver Creek valley bottom area.

Many structures were ignited there before the fire spread uphill and over a ridge to threaten the district of Salmon Arm.

In the largest evacuation in B.C. history, more than 7,000 residents were forced from their homes. Salmon Arm residents returned after a day, while the residents of Silver Creek were out for up to seven days.

### August 1998 – Salmon Arm, B.C.

Interface fire does not always ignite and burn explosively, striking with lightning speed as the Spokane fires did. The Silver Creek fire near Salmon Arm, B.C., was ignited on July 29 by lightning and eluded extensive control efforts for an entire week before high winds caused it to blow up and spread, threatening Salmon Arm.

When the smoke finally cleared:
- More than 40 buildings had been destroyed.
- More than 7,000 people had been evacuated.
- Suppression costs exceeded $10 million.

Lightning started the fire on the afternoon of July 29, 1998 – a hot and dry day. Forest Service air tankers immediately took action to contain the fire. Over the next seven days, the fire defied the control efforts of over 136 firefighters, 17 helicopters, 48 pieces of heavy equipment and numerous air tanker drops.



PHOTO: TONY FALCAO

PHOTO: KELVIN HIRSCH

## Fire Management and Wildland/Urban Interface Fires

Fire is a natural element in any forest or grassland. We can never eliminate it. Like storms, avalanches, and floods, it is a powerful force of change in nature. In fact, fire managers view forests as fuel, destined to burn from the moment they start growing.

Fire plays many valuable roles in our forest, parkland, and grassland ecosystems. Historic fires produced the varied mosaic of scenery and habitats that support many species of wildlife and birds. This is biodiversity—and this is what makes these areas attractive places to live.

As well, periodic fires are the major means of recycling and reducing the amount of fuel that continually accumulates on or above the ground. In cool temperate areas, decay is slow and logs, leaves, and needles pile up on the forest floor. The accumulated fuels increase the probability of large, intense fires that are difficult to control.

Since the retreat of the glaciers about 10,000 years ago, both lightning and humans have ignited the landscape. Historically, aboriginal people used


PHOTO: ALBERTA SUSTAINABLE RESOURCE DEVELOPEMENT

fire to herd game, create habitat for grazing or for nesting waterfowl, to encourage growth of edible plants, and keep travel routes open.

More recently, attitudes and practices have changed. Fire came to be seen as a danger to settlements, as well as a destroyer of wildlife and scenic beauty. Successful prevention programs, as well as the development of modern firefighting equipment and techniques, led to rigorous control that shut fire out of many forest and grassland areas.

Most researchers now agree that fire suppression is unfavorably altering many forest and grassland areas. Forests are becoming older, more closed in, and laden with fuels. Open habitats are disappearing and some plant and animal species are on the decline. As long as fire is excluded from the landscape, these trends are likely to continue. Investigations are now underway to identify innovative, ecologically based methods for managing forest fuels in ways that reduce wildfire risks, but also
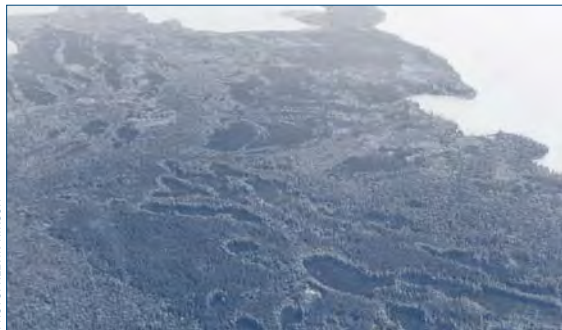

PHOTO: KELVIN HIRSCH

optimize ecological conditions, wildlife habitat and wildland/urban interface areas.

Modern fire protection organizations are attempting to reconcile this new view of fire with their primary responsibility—protecting life and property. In many wildland areas, agencies are taking steps to restore fire to the landscape—safely—by allowing fire to burn under closely prescribed conditions. However, in areas where forests mingle with homes or facilities, vegetation management is needed to reduce the likelihood of catastrophic fire losses.

In the interface, successful fire protection cannot rely solely on maintaining good fire control capability. To be successful, interface stakeholders must implement a combination of appropriate activities to raise awareness, reduce hazards, and plan for fire occurrences. We must develop FireSmart communities.

◄ *Fire managers igniting a planned or prescribed fire.*

"It has been a long time since my father and my uncles used to burn each spring. We were told to stop. The country has changed from what it used to be… brush and trees where there used to be lots of meadows. Not so many animals as there were before…"
76-YEAR-OLD CREE ELDER

◄ *Varied habitats and forest ages are often the result of past fires.*

◄ *In the interface, successful fire protection cannot rely solely on maintaining good fire control capability.*

# INTERFACE CASE STUDIES—PRAIRIE FIRE

In Canada, a number of fires have threatened residential communities. Fire protection officials agree that it will only be a matter of time before we have a number of tragic, made-in-Canada interface fires. For example, during the 1998 fire season, interface fires forced the evacuation of more than 18,000 residents. A further 46,000 were put on evacuation alert.

## December 14, 1997  Southern Alberta Prairie Fire

This fire started just before noon and moved rapidly upslope. It ignited from a domestic burning barrel that was screened but left briefly unattended. A sudden wind gust tipped it over. The fire moved northeast, rapidly pushed across the prairie by southwest winds gusting to 100 kilometres per hour.

The fire behavior was typical of prairie fire. It left a scar of burnt grass and stubble more than 35 kilometres long and 15 kilometres wide. So rapid was the fire's advance that residents of this farming area had no chance to evacuate in an orderly fashion, or prepare their properties for the fire's arrival. The fire front was finally stopped by firefighters who responded from more than 20 municipalities (using a four-lane-wide stretch of highway as a firebreak) about four hours after it started.

▶ *Southern Alberta, prairie fire.*
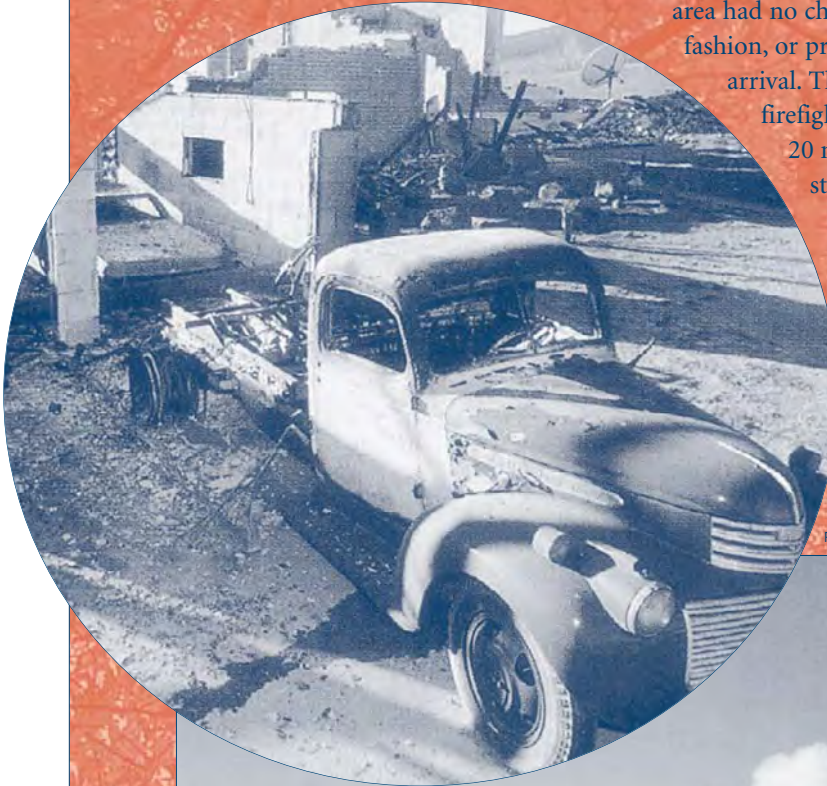
PHOTO: DAVID ROSSITER

▶ *Southern Alberta, prairie fire.*

PHOTO: DAVID ROSSITER

## Fire impacts

One resident died from burns, and several fire department firefighters were overrun by fire and suffered smoke inhalation and minor burns. This interface fire was an agricultural disaster for the region:

- Six homes and barns were burned.
- Five small bridges were burned.
- Many outbuildings, water tanks, corrals, and haystacks were burned.
- One hundred and twenty head of livestock were killed.
- Many miles of fencing and some powerlines were destroyed.



PHOTO: BRIAN MOTTUS

◄ ▲ *Chisholm fire, May 28 2001.*



PHOTO: BRIAN MOTTUS

# Interface Case Studies—Saskatchewan

## May 18 – 31, 2002 – Makwa Lake, Saskatchewan

This fire started May 18 in a Rural Municipality. With the help of Saskatchewan Environment, it was contained by May 24, but two days later it escaped containment and threatened the Pine Cove Resort. Once again, the Rural Municipality called on Saskatchewan Environment, and efforts to protect the resort began several days before the fire actually threatened it.

A bulldozer-constructed fire line, reinforced with sprinkler systems, was built 500 metres north of the resort. In addition, crews set up 12 Mark 3 pumps on the shoreline of Makwa Lake and established a network of hoses, using nozzles and sprinklers to saturate vegetation and wet down structures throughout the resort. Residents of the resort, the Makwa Lake Reserve, and local farms were evacuated.

When the fire advanced to threaten the resort on May 31, it was close to 23,000 ha in size. Crews attempted to backfire from the 3-4 blade-wide bulldozer line, which was in thick black spruce. Even though fuels along the fire line had been soaked by sprinklers, the fire crossed the line and continued advancing towards the resort to the south. Air tankers were brought in to lay a line of retardant over the cabins and adjacent fuels on the northern edge of the resort.

The resort was situated on a ridge, with mature white spruce forest cover (25 m in height, with a crown closure of 75% or greater). Cabins on the north end of the resort were surrounded with trees and vegetation and very little fuel modification had been done. The fire, advancing from the north, was described by ground crews as "having a good head of steam, lots of intensity and lots of embers."

None of the structures within the resort area were lost, although a spot fire (started 100 metres from the main fire) burned through dry grass to ignite a cabin that had not been provided with sprinkler protection. The burning cabin was spotted by Environment personnel and was quickly extinguished by ground crews, supported by helicopter bucketing.

This case was a successful one. A limited number of ground personnel used sprinklers to protect a threatened community. But making sprinklers available is not an alternative to application of FireSmart principles. Sprinklers require significant water supplies and are subject to mechanical failure. While several firefighters remained on site, it was only ready access to the lake that made this possible.

The effectiveness of sprinkler use is increased with pre-planning and training.
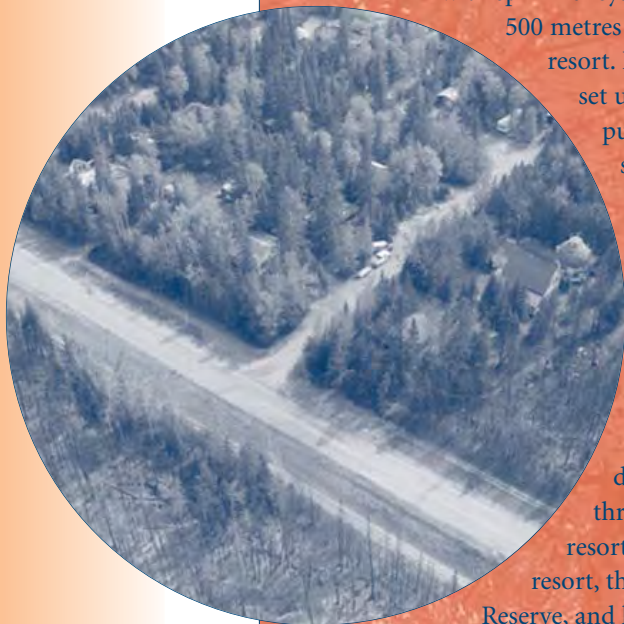


PHOTO: SASKATCHEWAN ENVIRONMENT



PHOTO: SASKATCHEWAN ENVIRONMENT

Although the few residents on site were evacuated quickly, property losses were significant:

- 54 buildings and 32 outbuildings had been destroyed.
- Two vehicles and more than 30 boats and ATVs were destroyed.
- Suppression costs were just over $1 million.

PHOTO: SASKATCHEWAN ENVIRONMENT

◄ *Air tankers attempt to contain northeast flank of James fire as it pushes closer to vacation residences on Horseshoe Bay.*

## May 22, 2002 – Turtle Lake, Saskatchewan

The James fire at Turtle Lake, Saskatchewan, was started when logging machinery caught fire and spread into slash and trees on the afternoon of May 22, 2002. Strong winds created a fast-spreading crown fire in the drought-stricken forest.

The fire originated within a Rural Municipality and Saskatchewan Environment crews were called upon to suppress the fire. Fire suppression crews responded immediately and were on-scene within half an hour. Despite the rapid response and numerous air tanker drops, the fire escaped suppression efforts.

The winds pushed the fire more than four kilometres towards a string of lakeside vacation residences located on the shoreline of Horseshoe Bay. Approximately two hours after the initial fire start, structures at Horseshoe Bay were burning, some ignited by embers from the fire and others ignited as fires spread from structure to structure in the area.

PHOTO: SASKATCHEWAN ENVIRONMENT



▲ *Residences destroyed by fire on the shore of Turtle Lake. Structures were ignited by embers from the main fire or by adjacent burning structures.*

# INTERFACE FIRE: COMMUNITY IMPACTS

## What Can and Will Happen

Typically, wildland/urban interface fires do tremendous damage, result in large economic losses, and have severe social impacts. Even the best-case scenario involves suppression costs, loss of adjacent forest resources, and some level of inconvenience.

The worst-case scenario involves loss of life and property; as well as the inconvenience, trauma, and costs of evacuating an interface community.

The impact on residents can include emotional trauma, the loss of or damage to homes and irreplaceable items, and even death or serious injury. Financial costs can include building and infrastructure loss or damage, business interruptions, and the cost of environmental rehabilitation, as well as the direct suppression and evacuation costs.

> "It's not a question of whether or not interface fire losses will occur in Canada but a question of when they will occur."
>
> **BRENT PEDERSEN, FIRE CHIEF, CANMORE, ALBERTA**



PHOTO: STEW WALKINSHAW

▲ *Fire hazard can exist in both forested and non-forested interface communities.*

Interface fire can move rapidly through agricultural landscapes. Drought conditions, high winds, and accumulation of fine fuels such as cured grass or stubble set the stage for destructive interface fires in areas located well away from any forests. In addition to building and equipment losses, crops, feed, soil, livestock, and farm infrastructure such as fences, bridges, culverts, irrigation systems, and power lines are all at risk of interface fires in farming areas.

# INTERFACE CASE STUDIES

*October 16, 1991  Spokane, Washington*

Interface fire brought a multi-fire disaster to the Spokane area. Winds gusting to 100 kilometres per hour swept across a four-county area in eastern Washington State. Within hours:

- 114 homes and many other buildings were destroyed.
- One resident died attempting to escape the flames.
- The value of structural losses was estimated at $18 million and direct suppression costs ran to more than $12 million.

Most of the fires started when winds blew down power lines or when trees or limbs fell into power lines. Many fires started in a very short period—all firefighters were rapidly committed, and some fires burned for up to three hours before firefighters could attend to them.



PHOTO: NFPA

# SPOKANE



PHOTO: NFPA

Fires like these have occurred for years, but the fires are more disastrous now because greater numbers of people are living in or adjacent to the forest. The Spokane firestorm is another example of the need for planning and fire prevention efforts targeted at reduction of interface fire dangers.
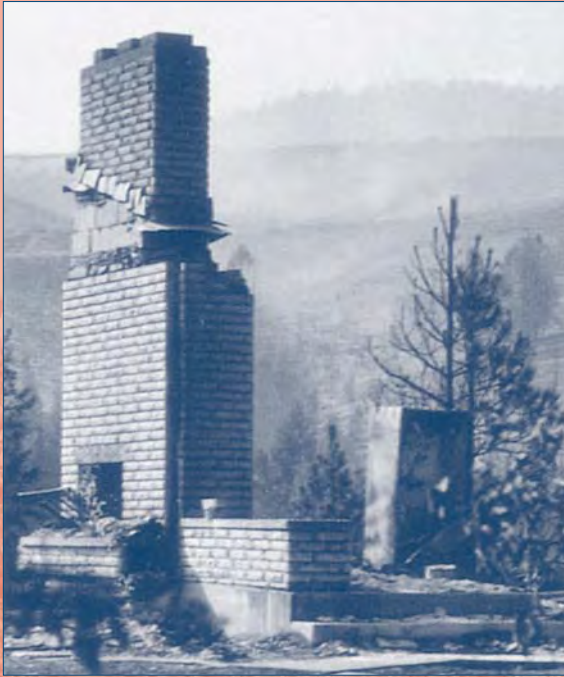
Firefighters had trouble assessing the magnitude of the fires because of the poor visibility caused by smoke and blowing dust. Most homes in the path of intense wildfire flames were doomed, no matter what heroic protection was attempted. Most of the home losses occurred within four hours of the fire start. Evacuation efforts were limited—only 2,500 residents actually left. Rapid spread of the fire, poor visibility, and communication failures (radio channels jammed by overuse) frustrated attempts to organize evacuations.

The dominant forest type in the region is ponderosa pine. Its resin and needles ignite easily and burn intensely. Once a fire was established, firebrands from these fuels became airborne and ignited other combustibles ahead of the active fire area, increasing the rate and area of fire spread.

In addition, the fuels were extremely dry because of a total lack of precipitation in the previous 41 days. Northeast Washington had experienced five years of lower-than-average precipitation followed by heavy spring rains that resulted in a heavy crop of grasses, which was a dry and abundant source of fuel by October. This combination aided ignition and the rapid growth and spread of the fire.



PHOTO: NFPA



PHOTO: NFPA

# Interface Tragedies

The North American public became more aware of the interface fire problem in 1985, when U.S. wildland fires damaged or destroyed 1,400 homes. Since then, destructive interface fires have occurred sporadically across the continent.

▶ The Stephan Bridge Road interface fire in 1990 destroyed 76 homes and 125 other buildings in Michigan.
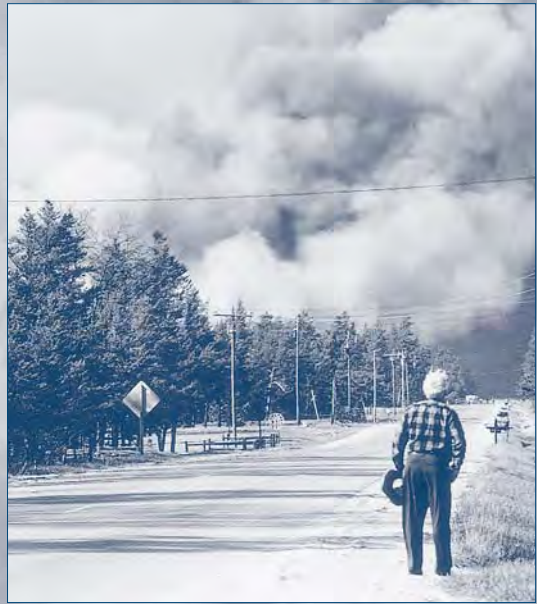


PHOTO: NFPA



PHOTO: NFPA

◀ The Black Tiger interface fire of 1989 destroyed 44 homes built on the scenic slopes of the Rocky Mountains near Boulder, Colorado.

▼ Oakland "East Bay Hills" interface fire occurred in October of 1991 with a total of more than 3,000 structural losses and 26 fatalities.



PHOTO: NFPA

# WILDLAND/URBAN INTERFACE FIRE CHALLENGES

## Know Your Opponent

### Wildland/urban interface fire behavior

*Fire behavior* is the way that fire ignites and spreads. Fire behavior is controlled by the three elements of the fire environment: fuel, weather, and topography. Of these factors, fuel is the only one that can be managed.

Several characteristics of fuel contribute to fire ignition and spread. Fuel moisture content is the most important of these: drier fuels ignite more easily and burn more intensely. Fuel size, arrangement, and the overall amount of fuel (loading) also affect fire behavior.

Weather conditions such as wind, precipitation, relative humidity, and temperature can cause fire to spread quickly and burn intensely—or extinguish it outright. Weather cannot be regulated. However, by

PHOTO: PARKS CANADA

PHOTO: PARKS CANADA
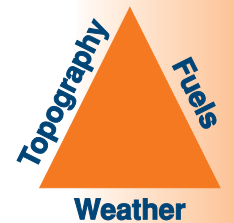
*Fire Behavior Triangle*

monitoring weather conditions, fire protection authorities can be more aware of changing fire danger so they can increase levels of fire preparation as needed.

Topography refers to the "lay of the land." The steepness of the slope, the direction it is facing (aspect), and terrain features like ravines or gullies have important influences on the rate of fire spread. Topography also affects fire spread by channelling wind. Although we cannot modify topography much, its effect can be minimized by good planning and careful placement of buildings.

We classify fires according to the fuels they are burning in—ground, surface, or crown.

**Ground fires** creep through the duff layer (organic soil) and decaying woody material beneath the forest floor. They are persistent, slow burning and difficult to detect and to extinguish.

**Surface fires** burn needles, twigs, branches on the forest floor, young trees, and the lower branches of standing timber. Surface fires are spread more quickly by wind.

**Crown fires** burn in the upper foliage and branches, as well as in surface and ground fuels. Crown fire occurs when high-intensity surface fire spreads or "ladders" upward through lower foliage into the

canopy above. Driven by wind or influenced by upper-atmosphere disturbances, crown fires travel quickly, and are difficult to control.

How fires start is also an important consideration. Ignitions are more frequent in the wildland/urban interface because of the increased presence of people—carelessness, recreation, damaged powerlines, and industrial activity are all potential ignition sources. Lightning-caused fires may also threaten interface areas.

The Canadian landscape is composed of major ecological regions, each with a unique combination of climate, vegetation, and topography. The boreal forest, aspen parkland, mountain forests, and grasslands are examples, and each has its own set of challenges that residents and managers need to recognize.

**Steep terrain and heavy fuels located downslope place this home at risk.**

*▼ The map below shows the potential for rapid spread and involvement of a typical wildland/urban interface community. In less than four hours, the fire front had moved three kilometres and destroyed 15 interface homes.*
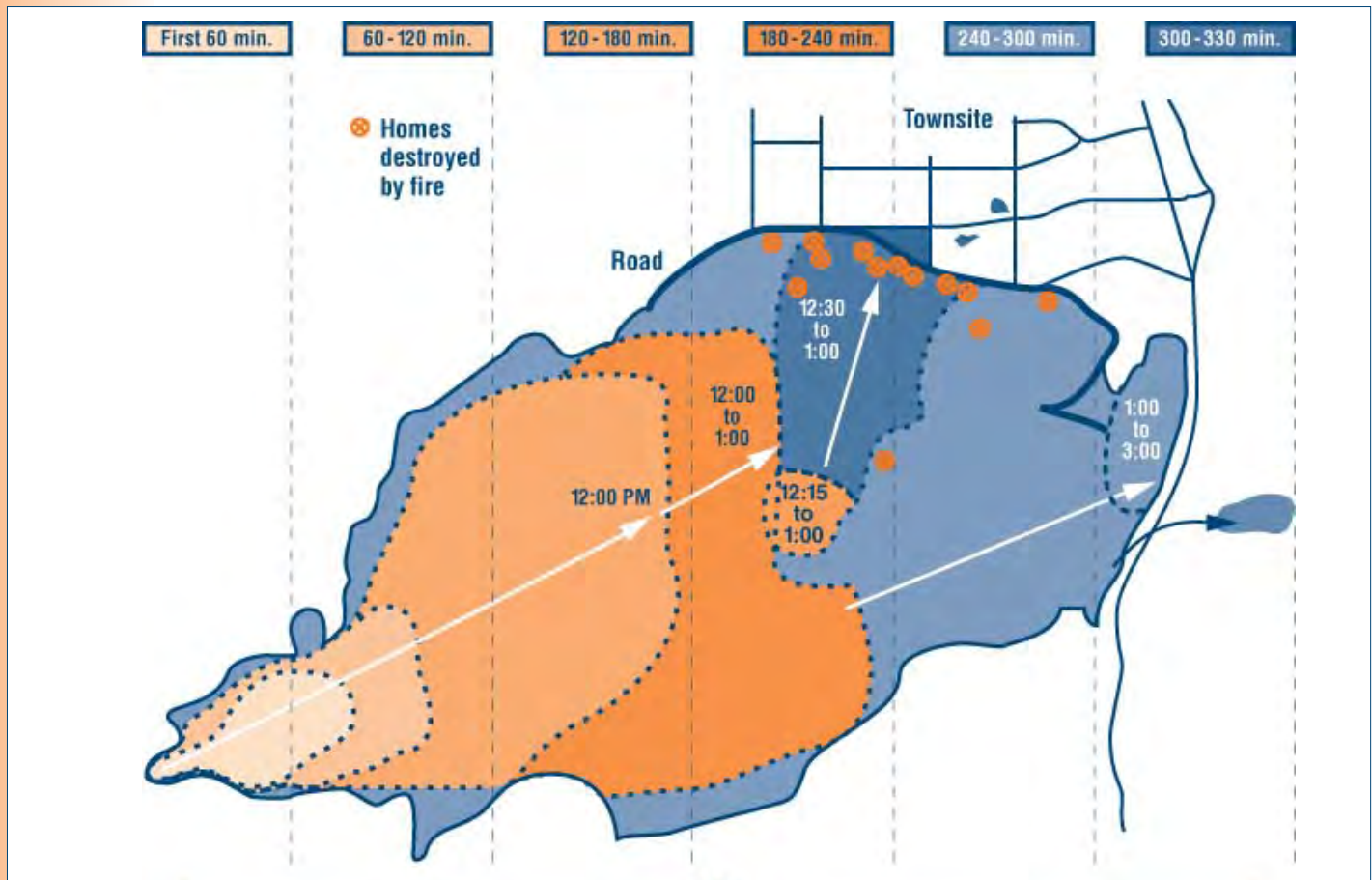
## Spot Fires and Interface Ignitions

Spot fires can hasten a wildfire's spread towards a community. Note the spot fire to the right side of the map - spotting distances of two kilometers are not uncommon and fires grow rapidly as spot fire ignitions burn ahead of the main fire. Note also, the potential for convection-carried firebrands to cause ignitions throughout the townsite at the top of the map. Heavy firebrand accumulations (150,000 firebrands / ha have been recorded) on and around buildings are often responsible for structural ignitions even though wildland fuels may be distant or fail to ignite.

Interface fire is often seen as a problem in areas of dense, coniferous forests where spectacular fire behavior occurs. However, equally disastrous interface fires have occurred in grasslands, aspen parkland, or previously logged areas where fine, flashy fuels can result in fast-spreading wildfires.

Wildland fire behavior specialists can calculate fire spread rates and make accurate short- and long-term predictions about fire size and perimeter location. They can predict fire intensity and other fire behavior characteristics, including the potential for spotting, and the difficulty of controlling the fire. This information helps in making estimates of resource requirements, fire perimeter distances, or the size of the area burned.

Techniques for predicting fire behavior also provide fire officials with the times they can expect the fire front to arrive, so they can issue appropriate evacuation advisories.

## Wildland/Urban Interface Fire Suppression Challenges

There are two principal ways that buildings can be ignited by wildfire.

First, wildland fires produce firebrands that are lofted into the air and travel great distances, often igniting spot fires ahead of the main fire. Firebrands that land on a combustible roof will usually start a fire that will consume the building if the fire is not suppressed. The reality of firebrand-caused ignitions is that buildings located in relatively urban settings, some distance inside the community interface boundary, are still vulnerable to wildland fires.

Second, direct flame contact or radiant heat can ignite vulnerable buildings. Ignitions can result from both vegetation-to-structure spread and structure-to-structure spread.

Wildland/urban interface fires are complex incidents that typically involve both wildland and structural fires. They often demand a joint response by wildland and structural firefighting agencies with specialized operating procedures and tactics. Even so, unless wildland/urban interface stakeholders have applied FireSmart principles and standards, these fires frequently overwhelm all available firefighting resources. There are not enough engines, equipment, or firefighters to protect a large number of threatened homes at the same time.

## Wildland/Urban Interface Fire — Solutions

### Who is responsible? We all are!

Solutions to the interface fire protection challenges facing Canadians are beyond the mandate or capabilities of any one agency or group. Ownership of the interface fire problem rests with interface community members. The key to resolving the problem is working together

For successful control of wildland/urban interface fires, people must work with emergency response agencies to manage fuels, make buildings fireproof, and develop appropriate infrastructure and planning.



PHOTO: SCOTTS PLASTICS

- Elected officials are responsible for land use policies that promote the health, safety, and welfare of the public.
- Municipal planners and developers are responsible for designing and building FireSmart buildings in surrounding areas.
- Property owners and residents are all responsible for providing fuel modified areas around their properties and constructing buildings in compliance with FireSmart guidelines. Recent research shows that the most effective way to reduce interface fire hazards is to construct buildings and treat vegetation within 30 metres of buildings in compliance with FireSmart guidelines. Hazard reduction strategies are the responsibility of the homeowner and decidedly outside the mandate of any fire protection agency.

> "Wildland/urban interface fires represent one of our most serious fire safety hazards."
>
> MURRAY HEINRICH, MANAGER, EMERGENCY SERVICES, YELLOWHEAD COUNTY

> "Working to solve our interface fire problem was good for our community — it brought a lot of people together to work towards a common goal — a FireSmart interface."
>
> ROSS RISVOLD, MAYOR, HINTON, ALBERTA

- Industrial managers with interface holdings must be diligent in ensuring that facilities are constructed and maintained in compliance with FireSmart guidelines. Industrial and commercial groups might consider the benefits of launching or participating in a local, regional, or national interface fire protection initiative. Interface fire prevention, awareness or hazard mitigation programs offer an excellent vehicle for demonstrating corporate goodwill and citizenship.
- Fire suppression agencies are responsible for providing rapid and effective response to interface fire starts.

Hazard assessment, fire awareness, and preparedness are responsibilities shared by all.

# FIRESMART LANDSCAPES

## FireSmart Challenges

Communities adjacent to forests and grasslands are associated with increased fuel loading, older age classes, increased forest density and continuous fuels. Values at risk and the strong probability of wind-driven fire events limit forest protection capability under high and extreme fire hazard. Uncontrolled wildfires have the potential to spread between flammable landscapes and communities where FireSmart strategies have not been applied. Efforts to make communities FireSmart may be compromised if the landscape surrounding the community is not also FireSmart.

## FireSmart Solutions

The process of developing FireSmart landscapes recognizes the interaction between economic, ecological and social impacts to minimize the negative impacts and enhance the positive impacts of fire at local and landscape levels. Strategies to minimize wildfire threat potential and mitigate the larger high intensity fires, include: reducing fire behavior potential, reducing fire occurrence risk, reducing the threat to values at risk, enhancing suppression capability, and enhancing opportunities for prescribed burning. A combination of factors leading to the identification of wildfire-related issues across the landscape, encompassing communities and landscape values are incorporated into the design of FireSmart landscapes. The outcome will increase human safety, decrease property losses and enhance wildland fire suppression success. This is a proactive approach to managing catastrophic wildfire

By strategically planning across the Landscape, Community and Interface zones, overlapping interests can be combined to integrate the needs of multiple jurisdictions to meet mutual objectives.

## How do we get to a FireSmart Landscape?

1. Get the right people to participate (key stakeholders, municipalities, wildland fire managers should be part of the process).
2. Perform a wildfire threat assessment, to understand the fire environment and identify issues across the landscape and surrounding communities.
3. Identify key objectives for the area you are concerned about.
4. Come up with strategies and tactics to achieve the objectives.

For more detailed information visit the FireSmart landscape website at: www.partnersinprotection.ab.ca

Landscape Zone

Community Zone 10km    Interface Zone    Community Zone 10km

Landscape Zone
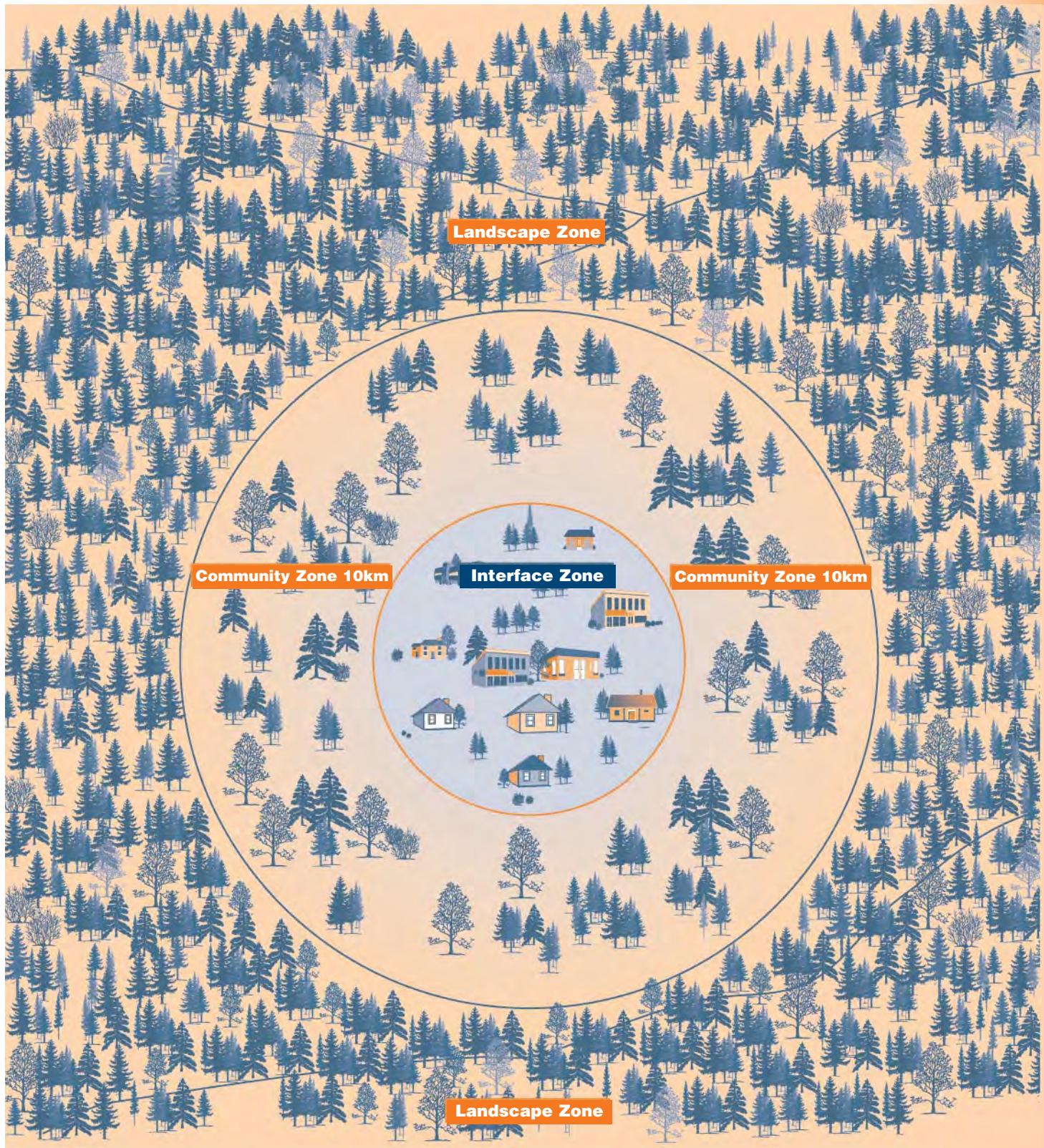
**FireSmart Zones**

*The Community Zone may be more or less than 10km, depending
on local forest conditions, to achieve FireSmart protection.*

# Wildfire Hazard Assessment System

**Chapter Two** *provides individuals and agency personnel with a structured and practical approach for assessing the hazard posed by wildfires to interface homes, facilities, or communities. This is an important step in raising awareness of the problem and identifying the needs for mitigative action.*

# The Wildfire Hazard Assessment System

In this chapter, Partners in Protection provides forms for evaluating the wildfire hazard and checklists to assess wildfire ignition potential and suppression capability.

The Wildfire Hazard Assessment System has two components. A Structure and Site Hazard Assessment Form evaluates building and adjacent site characteristics and an Area Hazard Assessment Form assesses site characteristics greater than 30 metres from the building itself.

Completing both portions of the Wildfire Hazard Assessment Form provides a complete assessment of the interface fire hazard a property is exposed to, from the perspective of the general area, local site, and the building itself. Therefore it is possible to have a relatively risk-free building in a

high-hazard area or a high-hazard building in a relatively risk-free area. Without examining each of these components, you cannot get a true picture of the hazards that exist.

The Fire Ignition and Prevention checklist assesses ignition potential for the building and site as well as the area. The Fire Suppression checklist evaluates the suppression capability of the fire service and individual home/property owners. These checklists can be a discussion guide in reviewing additional hazard factors with home or property owners.

The Wildfire Hazard Assessment Forms and Checklists provided at the end of this chapter (Page 2-29) should be photocopied. The forms and a copy of Chapter 2 can be given to individual homeowners or agency personnel to use for interface wildfire hazard assessments.

This chapter also provides a detailed description of each factor and guidelines for completing the forms.

## When to Conduct an Interface Wildfire Hazard Assessment

### Before development

Hazard assessment should be done before development, if possible. Effective hazard mitigation can be implemented in the design and planning stages of development if developers and property owners are made aware of the hazards inherent in a selected site or in building or infrastructure plans. Some jurisdictions now require that developers submit interface wildfire hazard assessments with initial proposals. Approval of proposals may be withheld or granted conditionally in areas where interface hazard ratings are high or extreme.

### After development

Interface wildfire hazard assessments may be performed reactively—after an interface area has been developed.

Interface homeowners or business people can initiate an assessment of existing developments as part of an individual or community-wide effort to increase safety and reduce the risk of property losses in case of wildfire.

At the post-development stage, hazard assessment is often done during site and building inspections by fire officials. These inspections can be an important part of a fire prevention program. Inspections may be initiated by a resident or property owner, or be part of a door-to-door interface fire awareness campaign within a high-hazard area.

As fire officials work through the hazard assessment form with the residents, the form serves to focus discussion and also serves as a checklist for mitigation work. Hazard assessment forms are completed and left with residents, while a record or copy can be kept on file by fire officials.

Whether assessments are performed before or after development, the assessment form and checklists will provide a structured format for review and discussion of all factors contributing to the on-site fire problems. Residents and communities will be more likely to take action to reduce the hazard posed by wildfire if they are aware of the conditions of their own buildings, site, and area.

# THE WILDFIRE HAZARD ASSESSMENT FORMS

The Wildfire Hazard Assessment Forms provide a quantitative procedure for assessing the interface fire hazard (i.e., potential fire behavior and susceptibility to ignition). Assigning points to it—the greater the hazard, the greater the number of points assigned—indicates how each item contributes to the hazard. Using the two forms, points are tallied and separate hazard ratings are derived for the general area as well as the structure and site. Hazard categories are typically low, moderate, high, and extreme. An interface building and site or area is not FireSmart unless it obtains a low or moderate hazard assessment score.

### Who Should Use the Interface Wildfire Hazard Assessment Form?

The hazard assessment form and checklists have been designed for agency personnel and interested individuals. Most questions are easy to answer. The form may appear technical, but this chapter explains each factor. If particular questions arise, homeowners should contact local fire officials for help. For a comprehensive evaluation, homeowners may be able to get the help of fire personnel in conducting an evaluation.

**Note to local fire officials:** Wildfire hazard assessments are an ideal opportunity to deliver interface fire prevention and preparedness messages. A fire official can target the delivery of the message to specific components of the on-site problems. The success of the interface wildfire hazard assessment program depends on the fire official being knowledgeable in all aspects of interface fire hazard assessment and mitigation.

Fire officials should have:

- Strong public relations, presentation, and communications skills, and be comfortable interacting with residents and property owners.
- Knowledge of wildland fire behavior, fire suppression tactics, and strategies.
- A strong working knowledge of FireSmart concepts and practices. Reviewing the material in this manual is a good preparation for the hazard assessment process.

### Guidelines for Completing the Wildfire Hazard Assessment Form

This section will help you perform hazard assessments effectively and consistently by outlining how each factor contributes to the overall hazard of the site or building assessed. It offers specific information about evaluation of factors under the characteristics and point ratings section for each factor. Use the page reference column in the form to refer back to specific information in this section.

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**INTERFACE FIRE HAZARD ASSESSMENTS ARE THE KEY TO PROPERTY OWNER INVOLVEMENT**

"The success of the Lake Edith Fire Protection Project is directly attributable to the hazard assessment procedure. Community attention was quickly focused on priority hazards with mitigation of those hazards commencing shortly thereafter."

DON CAMPBELL - CHAIRMAN OF THE LAKE EDITH FIRE PROTECTION PROJECT

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# USING THE STRUCTURE AND SITE HAZARD ASSESSMENT FORM

Evaluations using the Structure and Site Hazard Assessment Form should be completed for a building and the area within 30 metres of the building—Priority Zones 1 and 2—(below).

The Structure and Site Hazard Assessment Form assesses 11 factors. Each factor is given a point rating for the degree of interface fire hazard contributed by that factor. Cumulative point totals result in an overall building and site hazard level. Each factor on the form offers a choice of two-or three-point rating selections.

Add the individual point rating scores for each factor to get the hazard level for the building and site. Then use the table at the bottom of the form to determine if your hazard level is low, moderate, high, or extreme.

## INTERFACE PRIORITY ZONES



Priority Zone 3

Priority Zone 2

Priority Zone 1

10 m

20 m

70 m

100 m

30 m

10 m
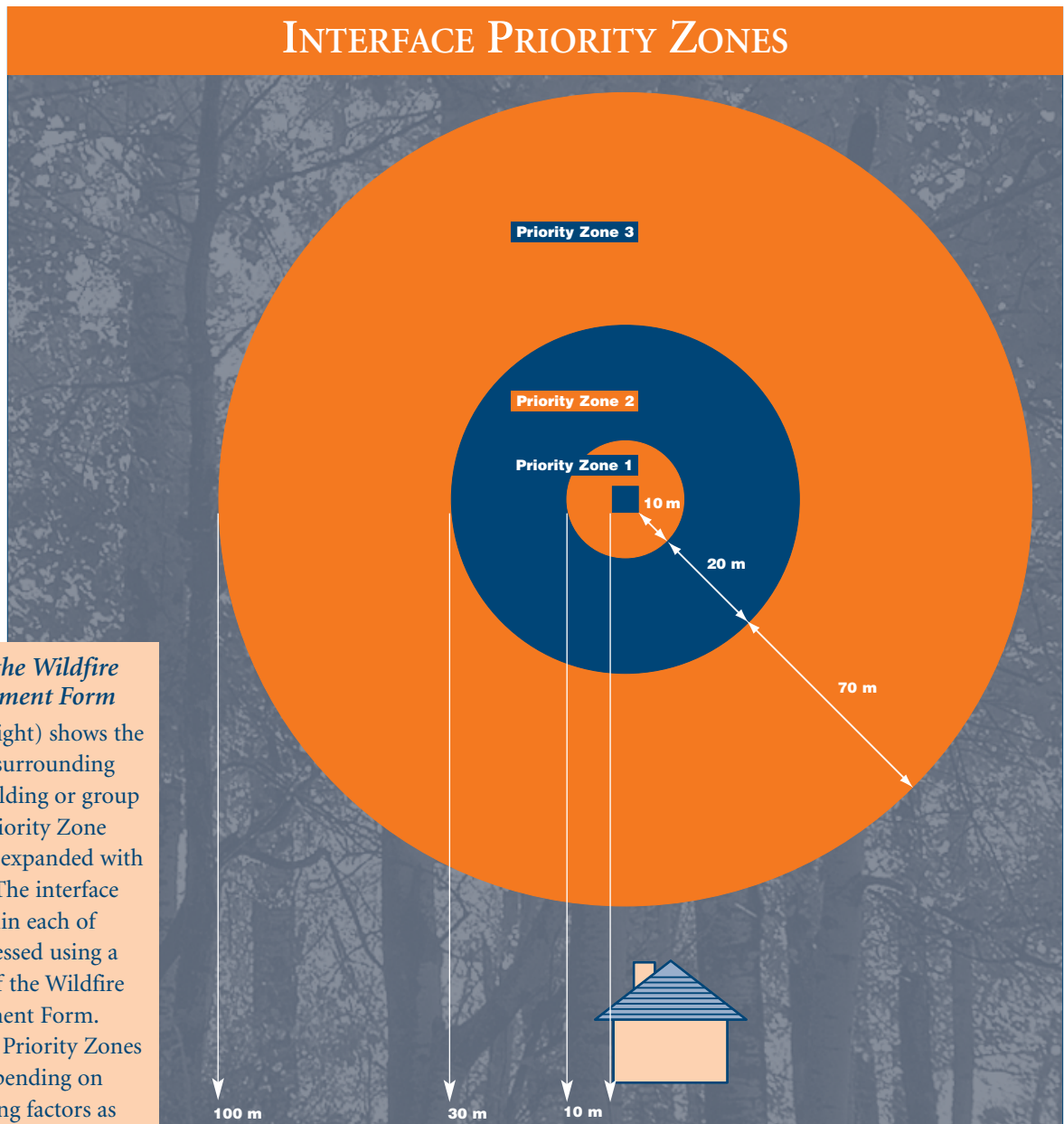
*Where to use the Wildfire Hazard Assessment Form*

The diagram (right) shows the Priority Zones surrounding an interface building or group of buildings. Priority Zone dimensions are expanded with steeper slopes. The interface fire hazard within each of the zones is assessed using a different part of the Wildfire Hazard Assessment Form.

The size of Priority Zones can expand, depending on such contributing factors as slope, aspect, and vegetation.

# STRUCTURE AND SITE HAZARD ASSESSMENT

| Factor | Page Reference | Characteristics and point ratings | | | Score |
|---|---|---|---|---|---|
| **1 Roofing Material** | 2-5 | Metal, tile, asphalt, ULC-rated shakes or non-combustible material | | Unrated wood shakes | |
| | | 0 | | 30 | |
| **2 Roof Cleanliness** | 2-6 | No combustible material | Scattered combustible material, < 1 cm in depth | Clogged gutter, combustible material > 1 cm in depth | |
| | | 0 | 2 | 3 | |
| **3 Building Exterior** | 2-7 | Non-combustible stucco or metal siding | Log, heavy timbers | Wood or vinyl siding or wood shakes | |
| | | 0 | 1 | 6 | |

# FACTOR 1 – ROOFING MATERIAL

The roof is most important in determining whether or not an interface fire will consume the building. Wildland fires produce firebrands that travel great distances, often igniting many spot fires ahead of the main fire. If not suppressed, firebrands landing on a combustible roof can start a fire that will consume the building.

Use only fire-retardant roof covering assemblies rated Class A, B, or C in interface areas. Roofing classifications denote the relative combustibility of the exterior roofing surface. The Class A rating denotes lower combustibility; the Class C rating denotes higher combustibility.

Install roofing material to preclude entry of flame or embers. Enclose undersides of overhangs (soffits) built of combustible material with 12-mm sheathing. Ideally, sheathing material should be non-flammable.

**Characteristics and Point Rating**



▲ **Metal, tile, asphalt, ULC-rated treated shakes or non-combustible material (0 pts) –** The most fire resistant and remain effective under severe fire exposure.



▲ **Unrated wood shakes (30 pts) –** Provide no fire protection.

# Factor 2 – Roof Cleanliness

Accumulation of combustible debris on a roof increases fire risk. The fire resistance of most roofing materials is reduced when needles and debris burn on the roof surface.

## Characteristics and Point Rating



PHOTO: JOHN LUCKHURST

▲ No combustible material or overhanging vegetation. (0 pts)



PHOTO: STEW WALKINSHAW

▲ Scattered combustible material, less than 1 centimetre deep. (2 pts)



PHOTO: DON MORTIMER

◄ Clogged gutter, combustible material, greater than 1 centimetre deep. (3 pts)

# FACTOR 3 – BUILDING EXTERIOR

With the exception of the roof, siding material is the structural component most vulnerable to fire. An interface fire involving the forest and vegetation surrounding a building will produce flames that can start the exterior on fire.

The high winds that often accompany wildfires can carry airborne firebrands and embers. These firebrands can easily become fires if lodged in and against structural exteriors. How well a building survives wildfire depends on how fire resistant the siding material is. Where the siding material is combustible or melts, it becomes more critical to clear vegetation or other combustible material from the building exterior. Similarly, eliminate or modify design features ("nooks and crannies") on the building exterior that act as firebrand accumulators.

Untreated wooden shake or shingle siding provides no fire protection for the building. Vinyl siding is vulnerable to fire exposure. It quickly melts, exposing areas on the building exterior where sparks and embers might lodge.

## Characteristics and Point Rating

PHOTO: KELVIN HIRSCH

◄ **Non-combustible siding. (0 pts)**

Materials such as stucco, metal siding, brick, cement shingles, concrete block, poured concrete, and rock offer superior fire resistance.

▼ **Log or heavy timber construction. (1 pt)**

Logs or heavy timbers provide a more fire-resistant building exterior than board siding.

PHOTO: KELVIN HIRSCH

PHOTO: KELVIN HIRSCH

◄ **Wood or vinyl siding or wood shakes. (6 pts)**

# FACTOR 4 – EAVES, VENTS, AND OPENINGS

While vents perform the important function of removing trapped moisture from attics, soffits, and crawlspaces, they are ready-made openings that can allow heat and embers to enter a building and ignite it. Open eaves (exposed rafter ends unenclosed by fascia and soffits) increase structural fire danger because more of the under-eave area is exposed to heat and embers. Under-eave soffit vents placed close to the exterior wall also increase structural fire hazard as heat and embers travel up exterior walls and directly into soffit vents.

All openings should be properly located and screened with corrosion-resistant, 3-millimetre wire mesh.

## Characteristics and Point Rating



PHOTO: DON MORTIMER
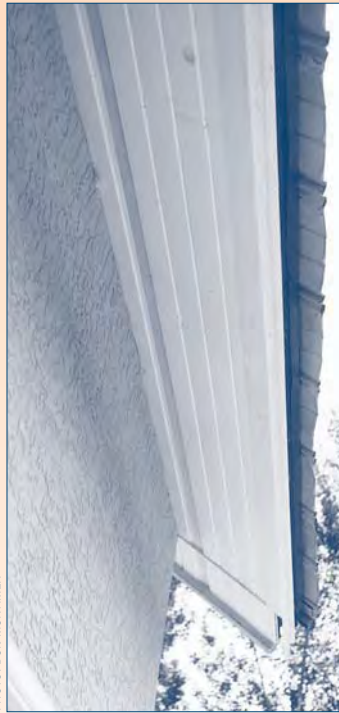
▲ **Closed eaves, vents screened with 3-millimetre mesh and accessible. (0 pts)**



PHOTO: DON MORTIMER

▲ **Closed eaves, vents not screened with 3-millimetre mesh. (1 pt)**



PHOTO: DON MORTIMER

▲ **Open eaves, vents not screened. (6 pts)**



◄ **Soffit vent too close to exterior wall**



◄ **Soffit vent properly located away from exterior wall**

# FACTOR 5 – BALCONY, DECK OR PORCH

Outdoor living areas are important to the interface lifestyle. Some homeowners may be unwilling to eliminate the stilt construction and overhangs of decks and balconies, despite the fire danger they create by trapping heat rising along exterior siding.

Stilt construction allows fire to get under overhangs and ignite the building. The fire danger is further increased if vegetation, debris, or stored combustibles accumulate under the overhang. Closing in balconies and decks and building them with flame-resistant materials affects the hazard rating.

Slotted deck surfaces can allow needle litter to accumulate below the deck, increasing the fire danger. There should be access to these spaces so that needle litter can be removed easily.

**Important Note:** Decks and balconies are part of the building. To measure the fuel modification area required, start from the outer perimeter of deck, balcony and overhang buildings.

## Characteristics and Point Rating



PHOTO: KELVIN HIRSCH

◄ **None or fire-resistant material — sheathed in. (0 pts)**

Balconies and undersides of decks or porches are built of non-combustible material.



PHOTO: KELVIN HIRSCH

▲ **Combustible material — not sheathed in. (6 pts)**

Balconies and undersides of decks or porches are built from combustible material and are not sheathed in.



PHOTO: JOHN LUCKHURST

▲ **Combustible material — sheathed in. (2 pts)**

Balconies and undersides of decks or porches are built of combustible material enclosed with 12-millimetre sheathing.

# FACTOR 6 – WINDOW AND DOOR GLAZING

Window glazing that fractures and collapses creates an opening in a building exterior that allows firebrands to enter the building. Avoid having concentrations of vegetative fuels within 10 metres of windows and glass doors.

Large windows, often used in interface homes to maximize view, are more vulnerable to fracture and collapse than smaller windows or multiple-pane windows. Triple or double (thermal) pane windows are more fracture- and collapse-resistant than are single pane windows. Tempered glass provides more safety than plate glass does. But it is unlikely that an interior will ignite from thermal radiation through *intact* plate glass.

## Characteristics and Point Rating

PHOTO: PELLA WINDOWS

### ◄ Tempered (0 pts)

Optimum protection is provided by tempered glass.

### ▼ Double pane (thermal pane) (1 or 2 pts)

Moderate protection is provided by double or thermal pane windows.

Small or medium (less than 1 x 1 metre) window pane size (1 pt)

Larger (1 x 1 metre) window pane size (2 pts)

PHOTO: PELLA WINDOWS

PHOTO: KELVIN HIRSCH

### ◄ Single pane (2 or 4 pts)

Use of single pane glass provides virtually no fire protection.

Small or medium (less than 1 x 1 metre) window pane size (2 pt)

Larger (greater than 1 x 1 metre) window pane size (4 pts)

# FACTOR 7 – LOCATION OF NEARBY COMBUSTIBLES

Firewood, building material (and other combustible debris piles), neighboring buildings and wooden storage shacks are all serious fire dangers. These items will ignite and burn intensely. Homeowners often do not consider the potential fire danger of these items and must be encouraged to clean up or relocate such accumulations of fuel farther from the building. Where combustibles are located downslope from a building, the hazard to buildings is increased.

**Important note:** Any combustible building (neighboring building, garage or carport) or assembly (fence or trellis) should be included in the assessment of Factor 7. Research indicates that neighboring structures are a significant potential ignition source, because of radiant heat exposure, longer burning times and the additional risk to the building from firebrands produced by nearby burning structures.

## Characteristics and Point Rating



◄ **None or more than 10 metres from building (0 pts)**

PHOTO: BRIAN MOTTUS



PHOTO: JOHN LUCKHURST



PHOTO: DON MORTIMER

◄ ▲ **Less than 10 metres from building (6 pts)**

# FACTOR 8 – SETBACK FROM EDGE OF SLOPE

The slope of the ground (see Factor 15, Page 2-19 for slope calculation methods) affects fire behavior and the rate of spread. Fire will burn more rapidly uphill than on a flat or level surface. Consider the location of the building on flat or rising ground and its position on the slope. Convective heat and firebrands from burning fuels on the slope below the building can readily ignite buildings located on the mid to upper portion or crest of a hill.

Structures located on a slope must feature entirely non-combustible exteriors and FireSmart design principles or they will be especially vulnerable to fire. Structures located at the crest of a hill can be protected somewhat by setback provisions. A single-story building should be set back 10 metres from the crest of the slope. Taller buildings will need proportionately greater setback distances.

## Characteristics and Point Rating
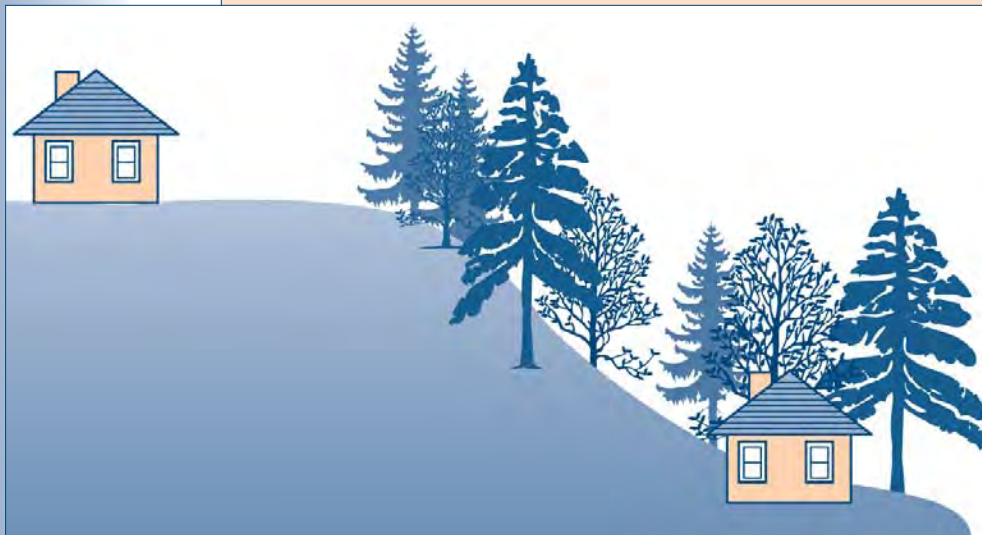
### ◄ Adequate (0 pts)

The building is located on the bottom or lower portion of a hill (or at the top of a slope but with adequate setback provision).
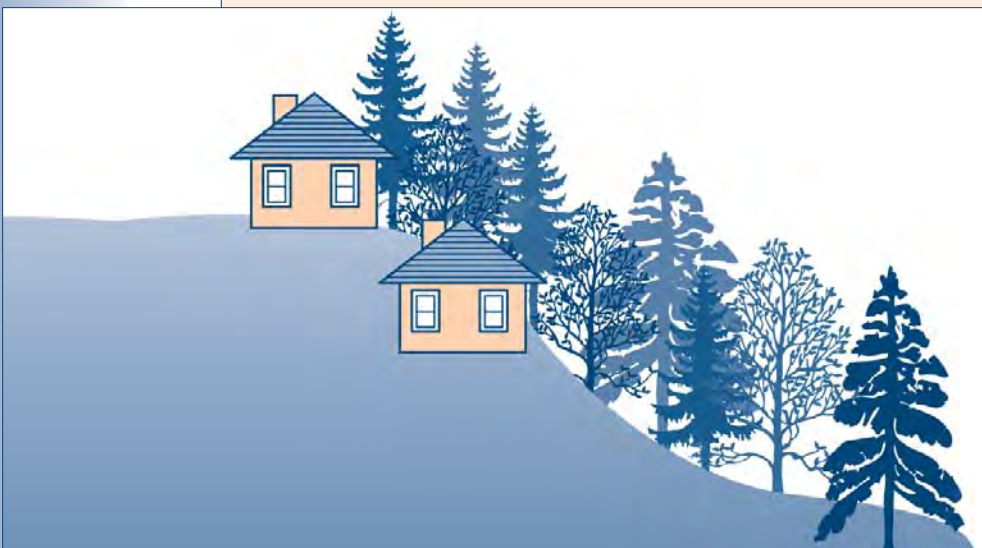
### ◄ Inadequate (6 pts)

The building is located on the mid to upper portion or crest of a hill.

### Special factor

Structures located on a slope that feature an entirely non-combustible exterior and have been built with the use of FireSmart design principles will get a zero point rating.

## Vegetation Assessment

The type and amount of vegetation surrounding a structure plays an important role in determining the interface hazard. Properly managed vegetation increases structural protection from approaching wildfires and also reduces the chance that a building fire will spread to the adjacent wildlands.

Vegetation in the area up to or beyond 30 metres from the building needs to be assessed. The Structure and Site Form has ratings for Priority Zone 1 (0-10 metres from the building exterior) and Priority Zone 2 (10-30 metres from the buildings). The Area Hazard Form is used in Priority Zone 3 (from 30-100 metres or more from the building). See Chapter 3 for more information on factors that can affect the size and shape of the three priority zones.

### Priority Zone 1

This zone, within 10 metres of a building, is the most critical zone because flammable vegetation within it will allow a wildfire to come within close proximity to, or in direct contact with, the structure. Fuels within this zone must be managed to create an environment that will not support wildfires of any kind.

### Priority Zone 2

This zone begins 10 metres from the building and extends to 30 metres from the building, depending on the topography. Flames, radiant heat and spotting embers from fires in this zone may ignite a structure. Fuels within this zone must be managed to create an environment that will only support fires of lower intensity and rate of spread.

### Priority Zone 3

Zone 3 begins 30 metres from the building, and extends to 100 metres or more. Structures are threatened primarily by spotting embers produced when high intensity crown fires occur in this zone.

*Note: Within factors 9 to 11 we use "vegetation" and "fuel" synonymously.*



PHOTO: STEW WALKINSHAW

# Factor 9 – Forest Vegetation (Overstory)

Crown fire in the forest vegetation presents a significant hazard to adjacent buildings. Buildings may ignite by radiant heat transfer when the fire is burning all around it, or when firebrands land on the building before the wildfire arrives.

Crown fire is most likely to occur and spread rapidly in dense coniferous forests. Mixed-wood forests are less likely to sustain crown fire; although, firebrand transport from pockets of coniferous trees can threaten buildings. Deciduous forests are unlikely to sustain crown fire, especially after leaf flush.

The probability of fire spreading laterally from crown to crown is reduced when coniferous trees are spaced far apart.

## Characteristics and Point Rating



PHOTO: KELVIN HIRSCH

### ◄ Deciduous
**>90% deciduous**

- within 10 m of structure (0 pts)
- within 10 - 30 m of structure (0 pts)



PHOTO: KELVIN HIRSCH

### ▲ Mixed wood
**>50% deciduous and <50% coniferous**

- within 10 m of structure (30 pts)
- within 10 - 30 m of structure (10 pts)

### ◄ Coniferous
**>50% coniferous and <50% deciduous**

- within 10 m of structure
  – separated (30 pts)
  – continuous (30 pts)
- within 10 - 30 m of structure
  – separated (10 pts)
  – continuous (30 pts)



PHOTO: KELVIN HIRSCH

# Coniferous — separated and continuous

▼ *Separated* – Low stand density where trees are widely spaced and crowns do not touch or overlap.



PHOTO: DON MORTIMER
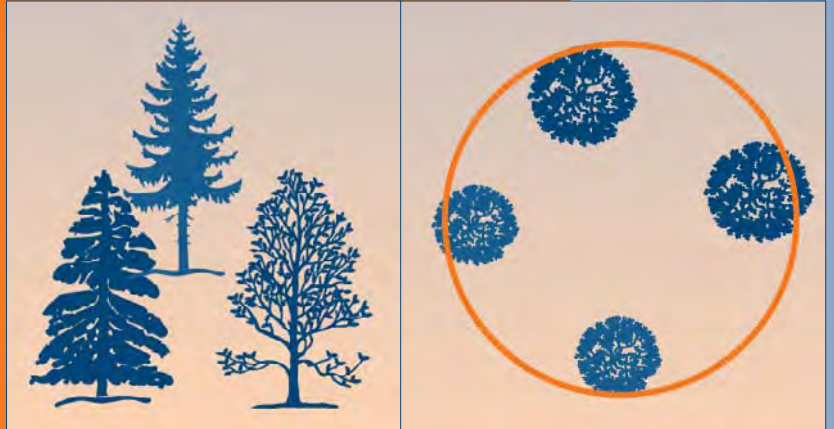
▼ *Continuous* – High stand density where trees are tightly spaced and crowns frequently touch or overlap.



PHOTO: KELVIN HIRSCH
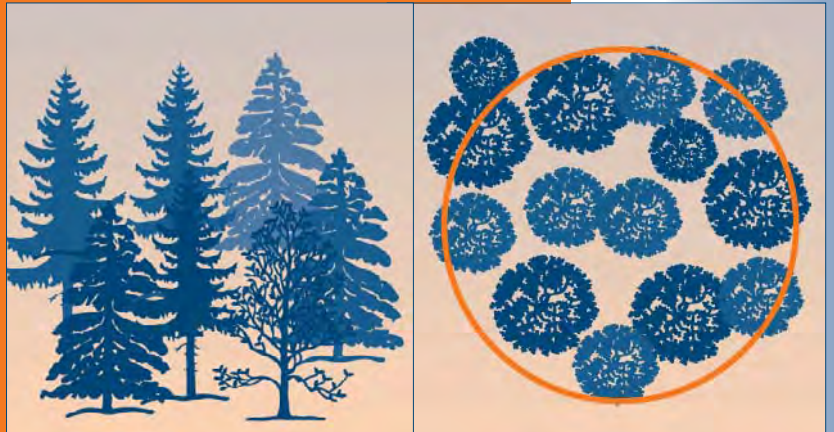
# Factor 10 – Surface Vegetation

Surface vegetation includes grasses, herbs, shrubs, dead and down woody debris (logs, branches, and twigs), and immature trees up to 2.5 metres in height. Concentrations of surface fuels will sustain high-intensity surface fires and can initiate crown fires.

Dry surface fuels are a particular concern when vegetation is cured due to drought or seasonal effects.

A surface fire can ignite interface buildings by direct contact with the building exterior or nearby flammable materials. Untreated surface fuels can also support and spread small accidental ignitions from the site to the surrounding continuous forest.

Treatment of surface vegetation is most critical in Priority Zone 1. Aggressive removal of all surface fuels and replacement with non-combustible materials or trimmed lawn is recommended.

Treatment of surface vegetation in Priority Zone 2 is also important. Removing all or most understory vegetation or accumulated ground fuels is recommended.

## Characteristics and Point Rating



PHOTO: RICK ARTHUR

▲ **Lawn or non-combustible material**

within 10 metres of building (0 pts)
within 10 - 30 metres of building (0 pts)



PHOTO: STEW WALKINSHAW

▲ **Wild grass or shrubs**

within 10 metres of building (30 pts)
within 10 - 30 metres of building (5 pts)

▶ **Dead and down woody material**

within 10 m of building
**scattered**
(30 pts)
**abundant**
(30 pts)

within 10 - 30 m of building
**scattered**
(5 pts)
**abundant**
(30 pts)



PHOTO: KELVIN HIRSCH

▲ *Scattered* – Groups of logs, branches and twigs are widely spaced (separated by 3 - 5 metres or more).



PHOTO: KELVIN HIRSCH

▲ *Abundant* – Groups of logs, branches, and twigs are continuous or nearly continuous.

# FACTOR 11 – LADDER FUELS

Ladder fuels are shrubs, immature trees, and branches extending near the ground (e.g. within 2 metres) that give surface fires a pathway to the upper canopies of the trees. Trees with branches extending near the ground (within 2 metres) have ladder fuels. Removal of ladder fuels reduces the likelihood of crown fire development.

## Characteristics and Point Rating

**Absent**

within 10 - 30 metres of building (0 pts)

**Scattered**

within 10 - 30 metres of building (5 pts)

**Abundant**

within 10 - 30 metres of building (10 pts)



PHOTO: DON MORTIMER

▲ *Scattered* – Ladder fuels are scattered if 25 – 75 percent of trees on site have ladder fuels closer than 2 metres to the ground.
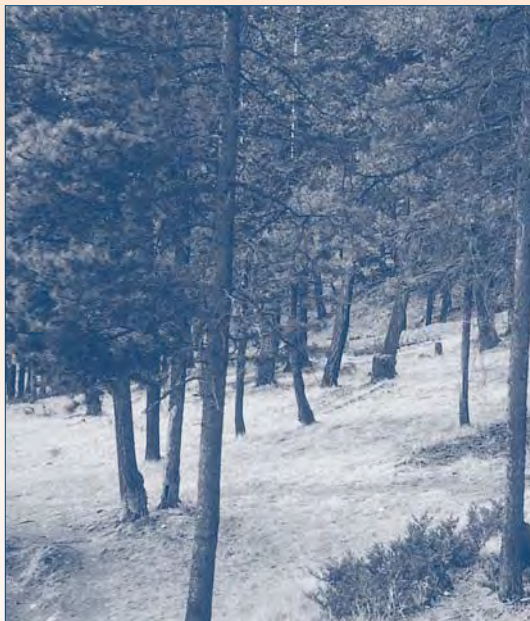


PHOTO: DON MORTIMER

▲ *Absent* – Ladder fuels are considered absent if fewer than 25 percent of trees on site have ladder fuels closer than 2 metres to the ground.



PHOTO: KELVIN HIRSCH

▲ *Abundant* – Ladder fuels are abundant if more than 75 percent of trees on site have ladder fuels closer than 2 metres to the ground.

# Using the Area Hazard Assessment Form

Evaluations using the Area Hazard Assessment Form should be completed for the area located beyond 30 metres from the building—Priority Zone 3—see diagram on Page 2-4.

The Area Hazard Assessment Form assesses five factors that influence potential fire behavior. Each factor gets a point rating for the degree of interface fire hazard contributed by that factor. Cumulative point totals result in a hazard level for the overall area.

Each factor on the form offers a choice of three point rating selections. To calculate the hazard level for the area, add the individual point rating scores for each factor. Then use the table at the bottom of the form to determine if your hazard level is low, moderate, high, or extreme.

## Area Hazard Assessment

| Factor | Page Reference | Characteristics and point ratings | | | | Score |
|---|---|---|---|---|---|---|
| 12  Forest vegetation (overstory) | 2-18 | Deciduous | Mixed wood | Coniferous | | |
| | | | | Separated | Continuous | |
| | | 0 | 15 | 15 | 30 | |
| 13  Surface vegetation | 2-18 | Lawn or non-combustible material | Wild grass or shrubs | Dead and down woody material | | |
| | | | | Scattered | Abundant | |
| | | 0 | 5 | 5 | 15 | |

## Factor 12 – Forest Vegetation (Overstory)

See Factor 9 reference on Page 2-14.
Assess forest vegetation in Priority Zone 3.

Deciduous: (0 pts)
Mixed Wood: (15 pts)
Coniferous: separated (15 pts)
Coniferous: continuous (30 pts)

## Factor 13 – Surface Vegetation

See Factor 10 reference on Page 2-16.
Assess surface vegetation in Priority Zone 3.

Lawn or non-combustible material: (0 pts)
Wild grass or shrubs: (5 pts)
Dead and down woody material: scattered (5 pts)
Dead and down woody material: continuous (15 pts)

## Factor 14 – Ladder Fuels

See Factor 11 reference on Page 2-17.
Assess ladder fuels in Priority Zone 3.

Absent: (0 pts)
Scattered: (5 pts)
Continuous (10 pts)

# FACTOR 15 – SLOPE

Slope has a direct effect on fire's rate of spread: the steeper the slope, the faster the rate of spread. In other words, fire will burn more rapidly uphill than on a flat or level surface. Consequently, fuels on slopes are treated/modified to a greater extent than they are on flat ground.

**Characteristics and Point Rating**

**0 – 10 percent**
(0 pts)

**10 – 25 percent**
even (4 pts)
or gullied (5 pts)

**more than 25 percent**
even (8 pts)
or gullied (10 pts)

## SLOPE

Slope is the angle of the ground measured from the horizontal. Percent slope is the change in elevation divided by the horizontal ground distance and multiplied by 100. A 50-percent slope means 50 metres of rise over 100 metres of horizontal distance. Make at least three measurements on the site and record the average value.

*Even* – Even slopes have a smooth or rolling texture. No abrupt variations are noted.

*Gullied* – Gullied slopes have cuts running up the slope, usually from water erosion, that provide funnels for upslope wind-driven fire spread.



50% slope

Change in elevation – 50 metres

Horizontal distance 100 metres
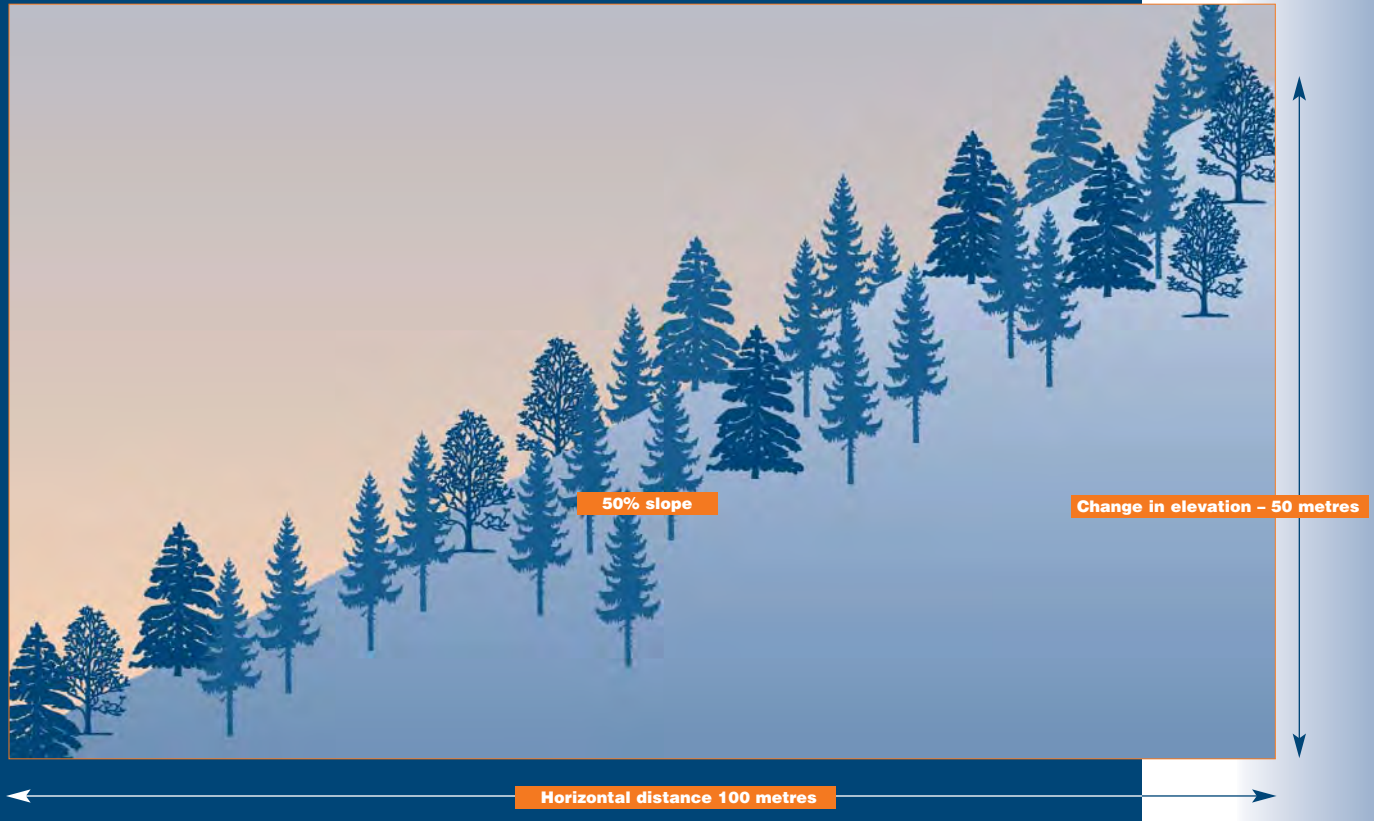
# Factor 16 – Position on Slope

The location of the zone or site on the slope will affect the fire danger levels. In general, locations higher up on slopes with fuels below face a significantly higher fire danger from rapid, high-intensity fire spread up the slope.

A review of Factor 8 (setback from edge of slope) is recommended. (See Page 2-12)

## Characteristics and Point Rating
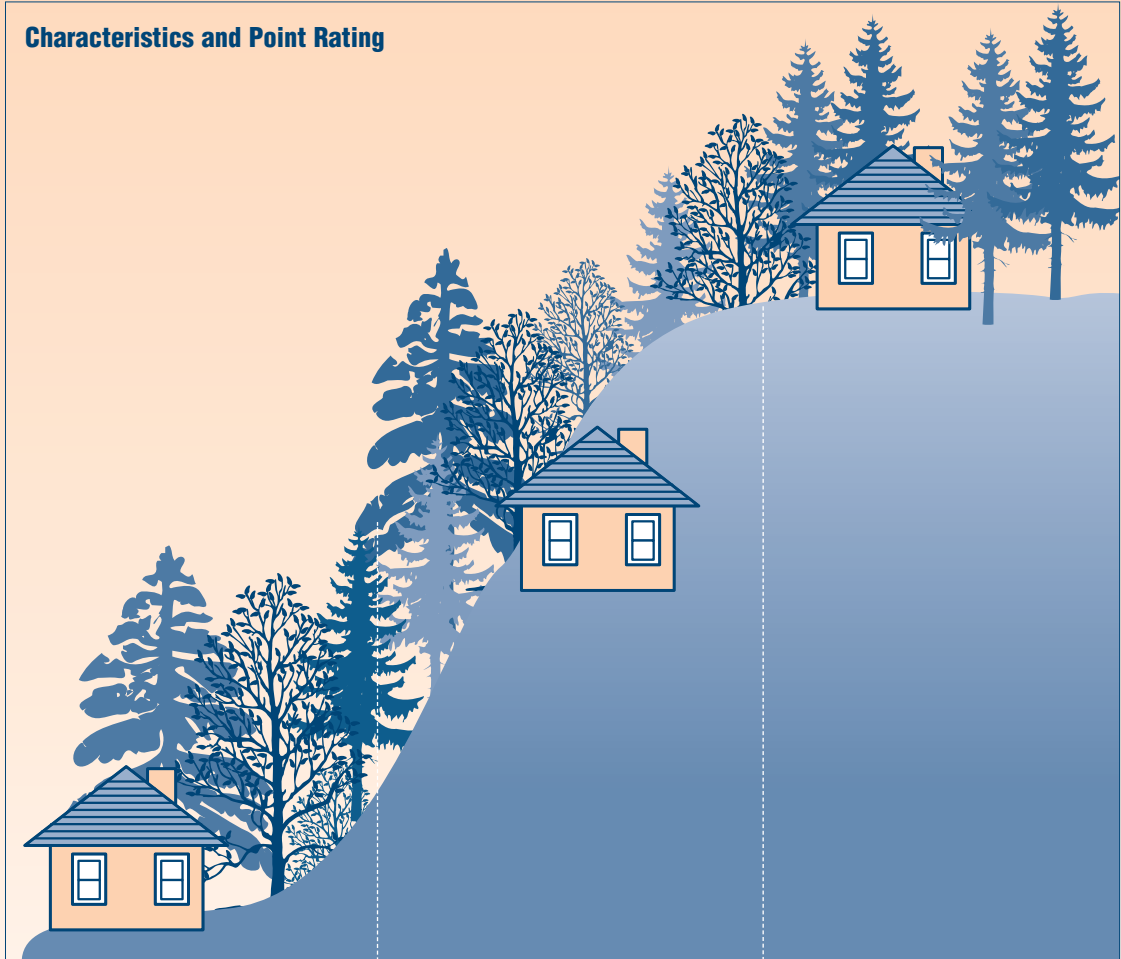


**▲ Valley bottom or lower slope (0 pts)**

Areas of development on flat ground or valley bottoms, extending as high as one-third of the way up the slope.

**▲ Mid-slope (3 pts)**

Areas of development on slopes with forested areas or grasslands below, extending as high as mid-way up the slope.

**▲ Upper-slope (5 pts)**

Areas of development located on the top half or crest of slopes with forested areas or grasslands below them.

# USING THE FIRE IGNITION AND PREVENTION CHECKLIST

The Fire Ignition and Prevention Checklist provides a "yes" or "no" assessment of ignition potential for the building and site, as well as the area. The checklist can be a valuable discussion guide for use in reviewing additional interface wildfire hazard factors with home or property owners.

## FIRE IGNITION AND PREVENTION CHECKLIST

| Factor | Page Reference | Yes | No |
|---|---|---|---|
| **Ignition Potential (Area)** | | | |
| Frequent lightning fires | 2-21 | | |
| Frequent or potential for human-caused fires | 2-21 | | |
| Aspect — south or west | 2-22 | | |
| **Ignition Potential (Structure and Site)** | | | |
| Chimney — Unscreened | 2-22 | | |
| Chimney — Overhanging branches | 2-22 | | |
| Chimney — Inadequate clearance | 2-22 | | |
| Burning barrel / fire pit — Inadequate | 2-23 | | |
| Overhead powerlines near vegetation | 2-24 | | |
| Propane tanks near vegetation / structure | 2-24 | | |

Questions answered with "yes" indicate conditions that contribute to hazard.

Questions answered with "no" are items favorable to lower hazard.

## Ignition Potential (Area)

### Frequent lightning fires

Areas with a historically high incidence of lightning-caused fires (determined through consultation with local fire protection officials).

### Frequent (or potential for) human-caused fires

Risk of accidental ignition is closely related to recreational use. Recreational use levels can be determined by old fire pits, horse droppings, heavily used trails, signs of 4 x 4 or ATV use, local knowledge, and the size of the local population. Local fire officials can provide information about the risk of human-caused fires.

Areas with a high risk of accidental ignition include any area within 1 kilometre of:

- Any type of Parks or Forest Service recreation site.
- Any area adjacent to high-use roads or trails showing signs of frequent human use.
- Any area with a history of recreational fire starts.
- Any area with excessive garbage and litter accumulations.

Areas with a low risk of accidental ignition include infrequent-use areas with no obvious access, and no signs of trails regularly travelled by humans.

Dumps or industrial (railway or sawmill) sources of fire starts within 500 metres of the site should also be considered as having a high risk of accidental ignition.

## Aspect

Aspect is the direction that the slope is facing (also called slope exposure). South exposures receive the most direct solar radiation from the sun, are the driest, and provide the best conditions for fires to ignite and spread. West exposures receive direct sunlight during the heat of the day, creating good late afternoon burning conditions. East exposures receive direct solar radiation only during the morning hours, when temperatures are low. North aspects receive little direct sunlight and fuels remain moist longer, providing the poorest conditions for fires to ignite and spread.

## Ignition Potential (Structure and Site)

### Chimneys

Chimneys are subject to many restrictions and installation standards covered by local building codes and insurance standards. These regulations exist because chimneys with inadequate clearances, overhanging vegetation, and unscreened openings present a serious fire danger to interface buildings and the surrounding forest.

Buildings with combustible roofs are especially vulnerable to roof ignitions from an unscreened chimney opening. Internal chimney fires are another area of concern. Interface residents should be reminded of the importance of regular chimney cleaning and maintenance.

## CHIMNEYS



PHOTO: JOHN LUCKHURST

**▶ Chimney – Overhanging branches**

Chimney outlets should have at least 3 metres clearance from all vegetation and obstructions.



PHOTO: STEW WALKINSHAW

**▲ Chimney – Unscreened**

All chimneys used with solid or liquid fuel burning devices should have approved spark arrestors. Arrestors must be securely attached and made of 12-gauge welded or woven wire mesh screen with mesh no coarser than 12 millimetres.



3 metres
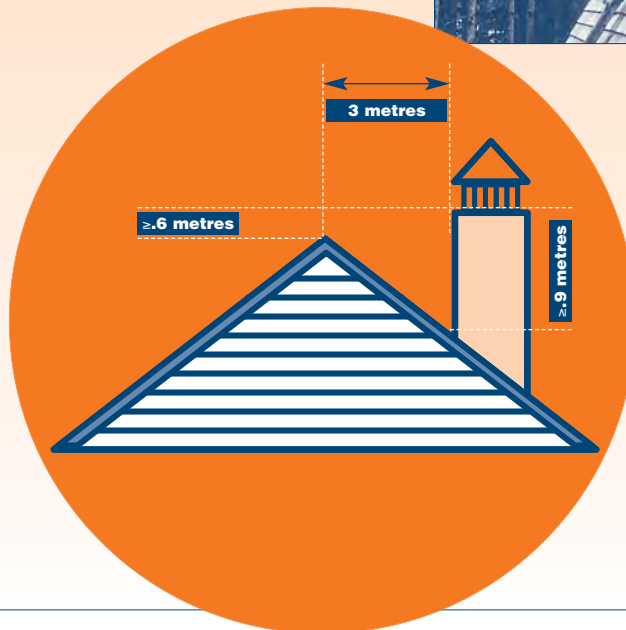
≥.6 metres

≥.9 metres

**◀ Chimney – Inadequate clearance**

Chimney outlets should be at least 0.6 metre higher than any part of the roof that is within 3 metres of the chimney and be located at least 0.9 metres above the point at which the chimney joins the roof surface.

# BURNING BARREL / FIRE PIT

## Burning Barrel / Fire Pit

Most provinces and municipalities require that burning barrels and fire pits be covered with a metal screen, and that they are surrounded by mineral soil, sand, rock or concrete strip for a defined distance.

It is the property owner's responsibility to contact local fire authorities in order to identify the appropriate mesh width for the screen and the distance from the fire edge to combustible materials. Combustible materials may include nearby vegetation, shrubs or trees, as well as building structures. Barrels should be wired to metal stakes. Fire pits should be less than 1 metre wide.

Homeowners must meet local codes and regulations.



**Inadequate**
**Carelessly burned trash can easily get out of control and turn into a wildfire.**

## Local Regulations May Vary

Alberta regulations for the forest protection area require that burning barrels and other incinerators be covered with a metal screen with a mesh size not exceeding 6 millimetres. In addition, they must be located over clean rock, gravel, sand, or mineral soil for a distance extending 3 metres or more from the barrel or incinerator edge.



7 to 16 mm wire mesh

Anchored to metal stakes

1 to 3 metres cleared to bare soil

**Adequate**
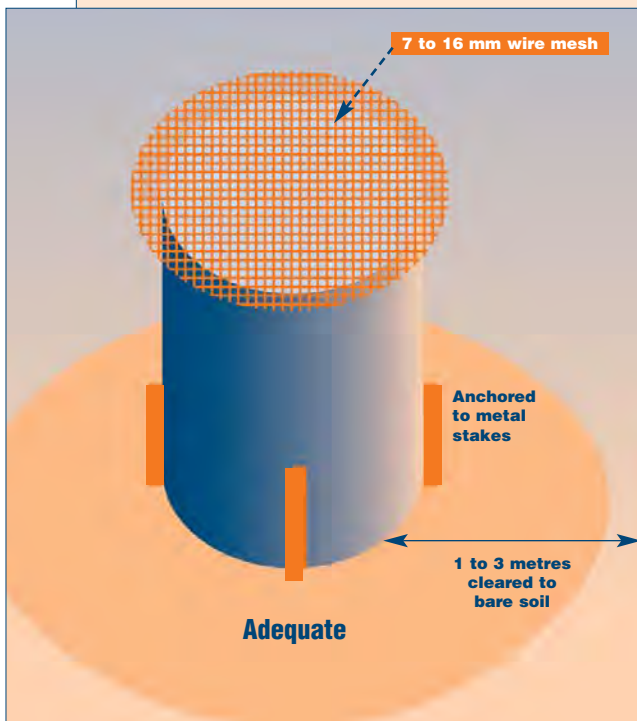
# BACKYARD BURNING

Fires must not be lit or allowed to continue to burn when the wind is strong enough to cause sparks to be carried to other combustible material; or when a notice banning or restricting the use of campfires is in effect. Equip yourself with a shovel and a pail of water containing at least 8 litres. These must be kept near the fire at all times. Never leave a fire unattended and be certain it is extinguished before leaving it.

PHOTO: BRIAN MOTTUS

*Overhead powerlines near vegetation*

Overhead distribution power lines are a possible source of ignition for interface fires. Appropriate clearances between vegetation and conductors should be maintained. Major accumulations of vegetation under the power lines may also contribute to ignitions. If maintenance is needed, check with the electrical utility in the area.



PHOTO: BRIAN MOTTUS

*Propane tanks near vegetation/buildings*

Propane tanks located amidst flammable vegetation or adjacent buildings are a significant hazard. Propane tanks should have all vegetation within 3 metres cleared away. Tanks should be located at least 10 metres from the building. Vents should face away from the building.

# USING THE FIRE SUPPRESSION CHECKLIST

The Fire Suppression Checklist provides a "yes" or "no" assessment of fire suppression capabilities for the building and site as well as the area.

The checklist can be a valuable discussion guide for use in reviewing fire suppression capabilities with home or property owners.

## FIRE SUPPRESSION CHECKLIST

| Factor | Page Reference | Yes | No |
|---|---|---|---|
| **Fire Service** | | | |
| Response time longer than 10 minutes | 2-25 | | |
| Access to area for emergency vehicles — Inadequate | 2-25 | | |
| Access to structure — Inadequate | 2-25 | | |
| **Water supply** | | | |
| Municipal — Not available | 2-27 | | |
| On-site — Not available | 2-27 | | |
| Suppression equipment on site — Not available | 2-28 | | |

Questions answered with "yes" indicate conditions that contribute to hazard.
Questions answered with "no" are items favorable to lower hazard.

## Fire Service

### Response time to fire

Where there is organized 24-hour fire service (adequately equipped and trained for wildland fire suppression) fire department response time is usually less than 10 minutes but varies locally. The local fire chief will give you exact times. In areas outside of fire service jurisdiction, fire protection resources will vary and response times may be inconsistent.

Response time is an important factor in all wildfire incidents. However, in large wildfire incidents, many homes may be threatened simultaneously and the fire service may not be available to protect every house.

### Access to area for emergency vehicles

Good tank truck access is essential for a successful response to interface fire. Tank truck access is considered inadequate unless trucks can get to within 100 metres of a fire location. Consult your local fire service to have access to your area appraised.

Tank trucks are very limited in their mobility and normally need paved or major gravel roads. Most full tank trucks have trouble negotiating adverse grades of more than 15 percent. Full tank trucks will also have trouble negotiating curves with a radius of less than 30 metres, on a gradient of more than 10 percent. A 7,000-litre tank truck will weigh up to 20 tonnes, so bridge weight and pipeline crossing restrictions must be considered.

### Access to structure

As well as accommodating emergency vehicles, many of which are heavy and large, access routes serve as escape routes for residents during a fire. Roads should provide safe simultaneous access for emergency vehicles and public evacuation. Access routes may also serve as firebreaks to provide fire protection and to assist interface fire suppression. For interface fire protection purposes, access route standards are divided into two categories — roadway standard, and fire service access standard as shown on the following page.

# Access to Structure



PHOTO: RICK ARTHUR



PHOTO: NFPA

**▲ Access for emergency vehicles – adequate**

Road width, grade, curves, layout, design, and bridge width and weight limits all provide adequate and safe emergency access. The roads function as a potential firebreak and fuelbreak.
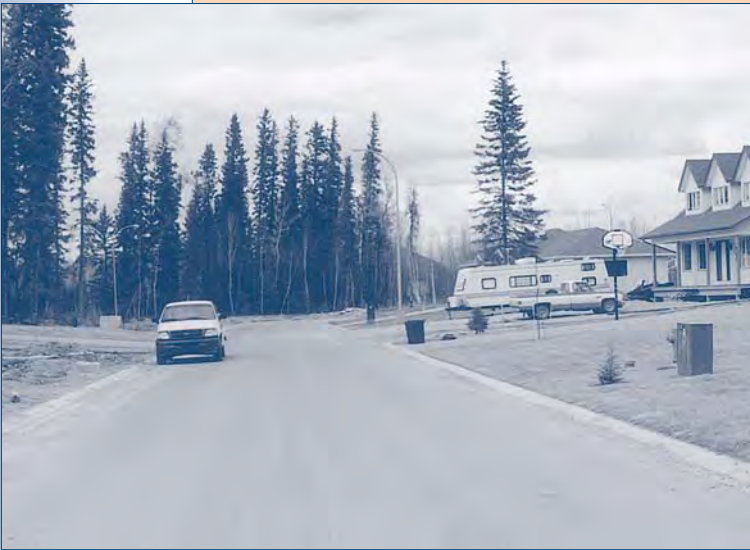
**▲ Example of a roadway standard**

Used where an access route serves three or more dwellings.

**▼ Access for emergency vehicles – inadequate**

Road width, grade, curves, layout, design, and bridge width and weight limits would not provide safe emergency access. More than 20 percent of the area is completely inaccessible to emergency vehicles. Roads have limited potential as a firebreak and fuelbreak.



PHOTO: NFPA

**▲ Example of a fire service access standard**

Used where an access route serves a building located more than 45 metres from a roadway. Safe and efficient access for both residents and firefighters is facilitated through good layout, design, construction, and maintenance of both roadways and fire service access routes.



PHOTO: CDF

# WATER SUPPLY

## Municipal water supply

A dependable and substantial source of water is the most effective firefighting resource. The capability of interface fire departments is limited by the availability of enough water, although training and the availability of equipment also play an important role in making a fire department effective.

**Available** — To be classified as available, a water source must be present and usable during the entire fire season (accessible by firefighters and capable of sustaining water supply during peak demand interface fire events with power outage). High-volume community wells or irrigation systems can be considered if they are accessible for quick hookup by firefighters. Residential wells and seasonal creeks should not be considered.

**Note:** Water storage capability (accessible by firefighters) using tanks, ponds, pools, or underground cisterns should be developed. Use of larger diameter—minimum 25 millimetre—water supply mains in interface areas will provide higher volumes and pressures if household water supply has to be used for fire suppression.

## On-site water supply

Some interface communities are not served by a fire department. Residents of these communities depend on water sources they have developed to supply firefighting water delivery systems that they have bought or built themselves. Wildland fire service response may or may not be available to residents of these areas.

**Available** — Some interface communities are served by a fire department and have a public water system. Fire hydrants are located near buildings. Water main size, fire hydrant spacing and capabilities will comply with Fire Underwriters Survey or National Fire Protection Association standards.



PHOTO: CDF



PHOTO: MIKE WIEDER

**Not Available** — Some interface communities have a fire department but no public water system. Water supply for fire suppression in these communities is limited to that carried on the fire trucks or developed on-site by the residents of the community.

## SUPPRESSION EQUIPMENT ON SITE

### Suppression equipment on site

**Available** — The following essential items of fire suppression equipment should be in an accessible location on the property in case a wildfire does occur.

- Hand tools (shovel, pulaski, and rake).
- Enough garden hose to reach roof top.
- Rooftop access ladder and sprinkler.



PHOTO: JOHN LUCKHURST

▶ *Interface fires often start as small accidental ignitions—timely action by properly equipped residents can make the difference between a fire that escapes and a fire that is quickly controlled.*
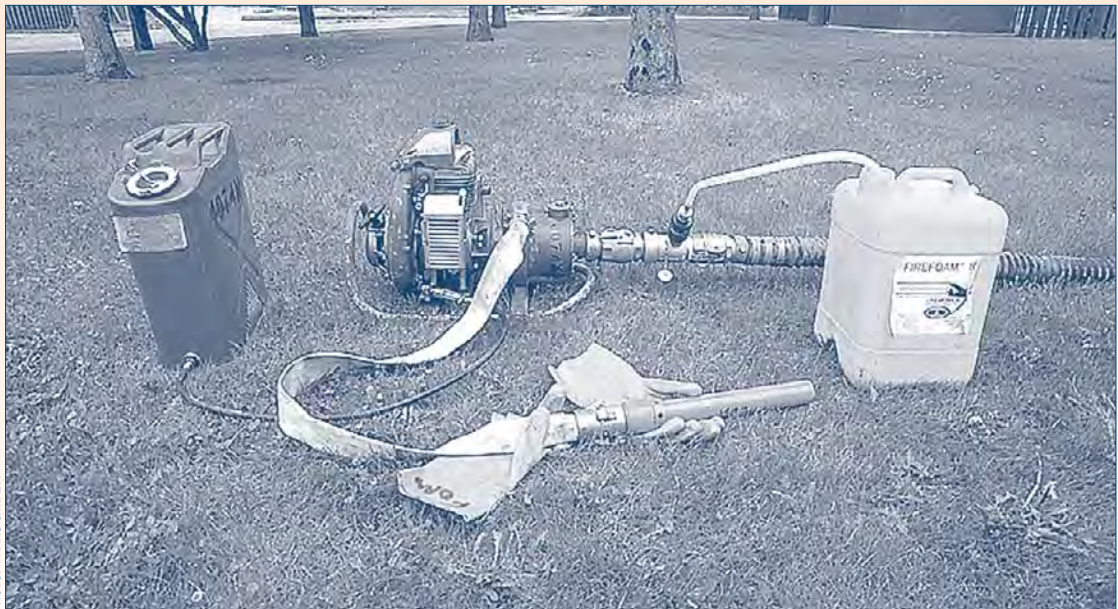


PHOTO: PARKS CANADA

# STRUCTURE AND SITE HAZARD ASSESSMENT FORM

| Factor | Page reference | Characteristics and point ratings | | | | | Score |
|--------|----------------|-----------------------------------|---|---|---|---|-------|
| **1 Roofing material** | 2-5 | Metal, tile, asphalt, ULC-rated shakes or non-combustible material | | | Unrated wood shakes | | |
| | | 0 | | | 30 | | |
| **2 Roof cleanliness** | 2-6 | No combustible material | Scattered combustible material, <1 cm in depth | | Clogged gutter, combustible material ≥1 cm in depth | | |
| | | 0 | 2 | | 3 | | |
| **3 Building exterior** | 2-7 | Non-combustible stucco or metal siding | Log, heavy timbers | | Wood or vinyl siding or wood shake | | |
| | | 0 | 1 | | 6 | | |
| **4 Eaves, vents and openings** | 2-8 | Closed eaves, vents screened with 3 mm mesh and accessible | Closed eaves, vents not screened with 3 mm mesh | | Open eaves, vents not screened, debris accumulation | | |
| | | 0 | 1 | | 6 | | |
| **5 Balcony, deck or porch** | 2-9 | None, or fire-resistant material sheathed in | Combustible material, sheathed in | | Combustible material, not sheathed in | | |
| | | 0 | 2 | | 6 | | |

| **6 Window and door glazing** | 2-10 | Tempered | Double Pane | | Single Pane | | Score |
|---|---|---|---|---|---|---|---|
| | | | Small/medium | Large | Small/medium | Large | |
| | | 0 | 1 | 2 | 2 | 4 | |

| **7 Location of nearby combustibles** | 2-11 | None or >10 metres from structure | | <10 metres from structure | | |
|---|---|---|---|---|---|---|
| | | 0 | | 6 | | |
| **8 Setback from edge of slope** | 2-12 | Adequate | | Inadequate | | |
| | | 0 | | 6 | | |

| **9 Forest vegetation (overstory)** | 2-14 | Deciduous | Mixed wood | | Coniferous | | Score |
|---|---|---|---|---|---|---|---|
| | | | | | Separated | Continuous | |
| <10 metres | | 0 | 30 | | 30 | 30 | |
| 10 - 30 metres | | 0 | 10 | | 10 | 30 | |

| **10 Surface vegetation** | 2-16 | Lawn or non-combustible material | Wild grass or shrubs | | Dead and down woody material | | Score |
|---|---|---|---|---|---|---|---|
| | | | | | Scattered | Abundant | |
| <10 metres | | 0 | 30 | | 30 | 30 | |
| 10 - 30 metres | | 0 | 5 | | 5 | 30 | |

| **11 Ladder fuels** | 2-17 | Absent | Scattered | Abundant | Score |
|---|---|---|---|---|---|
| 10 - 30 metres | | 0 | 5 | 10 | |

| | |
|---|---|
| **Total Score for Factors 1 – 11** | |
| **Structure and Site Hazard Level** | |

**Hazard Level**  Low <21 points   Moderate 21-29 points   High 30-35 points   Extreme >35 points

# Area Hazard Assessment Form

| Factor | | Page reference | Characteristics and point ratings | | | | Score |
|---|---|---|---|---|---|---|---|
| 12 | **Forest vegetation (overstory)** | 2-18 | Deciduous | Mixed wood | Coniferous | | |
| | | | | | Separated | Continuous | |
| | | | 0 | 15 | 15 | 30 | |
| 13 | **Surface vegetation** | 2-18 | Lawn or non-combustible material | Wild grass or shrubs | Dead and down woody material | | |
| | | | | | Scattered | Abundant | |
| | | | 0 | 5 | 5 | 15 | |
| 14 | **Ladder fuels** | 2-18 | Absent | Scattered | Continuous | | |
| | | | 0 | 5 | 10 | | |
| 15 | **Slope** | 2-19 | 0 - 10% | 10 - 25% | | >25% | | |
| | | | | Even | Gullied | Even | Gullied | |
| | | | 0 | 4 | 5 | 8 | 10 | |
| 16 | **Position on slope** | 2-20 | Valley bottom or lower slope | Mid-slope | Upper-slope | | |
| | | | 0 | 3 | 5 | | |
| | | | | | **Total Score for Factors 12 – 16** | | |
| | | | | | **Area Hazard Level** | | |

**Hazard Level**  **Low <21 points**  **Moderate 21-29 points**  **High 30-35 points**  **Extreme >35 points**

**Remarks**

_____

_____

_____

_____

_____

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## FIRE IGNITION AND PREVENTION CHECKLIST

| Factor | Page Reference | Yes | No |
|---|---|---|---|
| **Ignition potential (area)** | | | |
| Frequent lightning fires | 2-21 | | |
| Frequent or potential for human caused fires | 2-21 | | |
| Aspect — south or west | 2-22 | | |
| **Ignition potential (structure and site)** | | | |
| Chimney — unscreened | 2-22 | | |
| Chimney — overhanging branches | 2-22 | | |
| Chimney — inadequate clearance | 2-22 | | |
| Burning barrel / fire pit — inadequate | 2-23 | | |
| Overhead powerlines near vegetation | 2-24 | | |
| Propane tanks near vegetation / structure | 2-24 | | |

Questions answered with "yes" indicate conditions that contribute to hazard.

Questions answered with "no" are items favorable to lower hazard.

## FIRE SUPPRESSION CHECKLIST

| Factor | Page Reference | Yes | No |
|---|---|---|---|
| **Fire service** | | | |
| Response time longer than 10 minutes | 2-25 | | |
| Access to area for emergency vehicles — inadequate | 2-25 | | |
| Access to structure — inadequate | 2-25 | | |
| **Water supply** | | | |
| Municipal — not available | 2-27 | | |
| On site — not available | 2-27 | | |
| Suppression equipment on site — not available | 2-28 | | |

Questions answered with "yes" indicate conditions that contribute to hazard.

Questions answered with "no" are items favorable to lower hazard.

# Solutions and Mitigation

*Chapter Three provides users with solutions or mitigative approaches to reduce the hazard posed by interface fire to communities or homes. The principal aspects and recommended guidelines for interface fire hazard mitigation are discussed in three sections: vegetation management, structural options, and infrastructure. A FireSmart community meets or exceeds these guidelines. Having your community working toward these guidelines is a worthwhile goal.*

## Introduction

During a major interface fire with a number of buildings at risk, firefighters may have to decide which buildings they should try to save. It is futile to try to protect buildings or homes shrouded in dense forest fuels. Some firefighters have paid for such efforts with their lives.

Unprotected buildings, whose owners have not applied FireSmart principles and standards, may not receive priority action from firefighters. In the interface, FireSmart buildings are the result of owners' efforts. This chapter provides concerned homeowners, community groups, and officials with detailed information on the best options for fire protection in the wildland/urban interface. Mitigation of fire in

the wildland/urban interface is discussed in three sections: vegetation management, structural options, and infrastructure.

These guidelines are based primarily on National Fire Protection Association (NFPA) standards that are published as a code: NFPA 1144 — Standard for Protection of Life and Property from Wildfire. We also include the recommended guidelines of a variety of fire protection agencies.

NFPA 1144 standards are untested in northern (boreal forest) conditions. Fire protection officials feel that the NFPA 1144 standards should be viewed as minimum guidelines in the north.



CHAPTER PAGE PHOTOS: RAPID FIRE AND RESCUE SERVICES AND RICHARD SIEMENS (FLAMES)

PHOTO: NFPA

# VEGETATION MANAGEMENT

Reduction of fire danger in fuels capable of supporting fast-spreading, high-intensity fires often requires significant intervention—removal, reduction, or conversion of on-site fuels.

Apply these fuel-management recommended guidelines with discretion. Each interface community must decide what level of treatment is permissible or desirable before the aesthetic and wilderness virtues of the community are threatened.

Interface residents should meet to decide on acceptable levels of fire hazard reduction and then determine how to accomplish the hazard reduction. Fire officials can support this dialogue by organizing meetings and providing unbiased information on the pros and cons of various strategies.

**Note: Within this section, the words "vegetation" and "fuel" are used synonymously.**

## VEGETATION MANAGEMENT STRATEGIES

Other factors that figure prominently in a community's choice of vegetation management strategy are maintenance, water requirements, homeowner capabilities, erosion control, and historical weather and fire behavior patterns.

Vegetation management strategies break down into three approaches. These are:
•    Fuel removal
•    Fuel reduction
•    Fuel conversion



**Before**

Recommended guidelines are provided for each vegetation management strategy. For communities or individuals seeking a higher degree of protection, vegetation management standards providing a higher level of protection are outlined in Appendix 2: Fuel Reduction Standards for Crown Fire Hazard.



**After**

# Establishing Priority Zones

Before planning or initiating fuel management activities around buildings or facilities in the interface, we suggest that three concentric Priority Zones be established around each building. There are unique vegetation management activities recommended for each priority zone.

**Priority Zone 1:**  This area is immediately adjacent to a given building and extends outward in all directions for a recommended minimum of 10 metres in flat terrain. The main objective of vegetation management in this zone is to create an environment that will not support fire of any kind. In some situations, this may be the only zone or area that homeowners need to manage.

**Priority Zone 2:**  This area begins 10 metres from the building and extends to 30 metres from the building. The main objective of fuel management within this zone is to create an environment that will only support fires of lower intensity and rate of spread.

**Priority Zone 3:**  This area begins 30 metres from the building and extends to 100 metres or farther from the building. Fuel management in this area may only be needed in specific cases, when high hazard levels resulting from heavy continuous forest vegetation and steep topography are not reduced enough by fuel management in Priority Zone 2.

Specific vegetation management strategies such as fuel removal, conversion, and reduction are outlined in more detail later in this section.

**Fuel Modifications and Priority Zones:** While some homes or facilities will be able to meet their fuel modification requirements by treating fuels in Priority Zone 1 only, other homes and facilities will require treatment of fuels within Priority Zones 1, 2, and 3.

**Establishing Priority Zones**
**Fuel Modified Areas and Firefighter Safety:** Current research indicates that firefighters are more vulnerable to the radiant heat generated by large wildland fires advancing on an interface property than are the structures themselves. While creation of adequate fuel modified areas between the structure and vegetation will significantly reduce the chance of building ignitions, it cannot provide a safe environment for firefighters. Firefighters recognize the advantage that fuel modified areas provide in establishing effective fire suppression actions but follow designated safe work procedures that require them to retreat to designated safety zones during high levels of fire behavior as the fire passes through an interface area.

Priority Zone 3
Priority Zone 2
Priority Zone 1
10 m
20 m
70 m
100 m
30 m
10 m
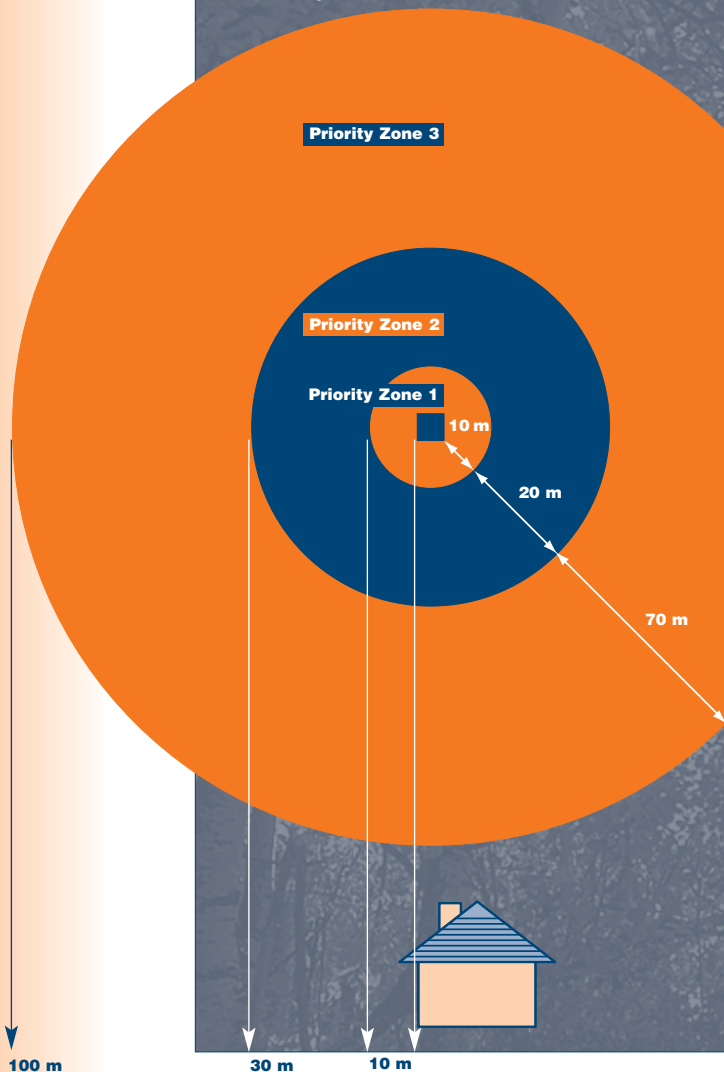
## Priority Zone 1: Area Within 10 Metres of a Building

The goal of vegetation management in Priority Zone 1 is to create a fuel modified area in which flammable vegetation surrounding buildings is eliminated or converted to less flammable species. This fuel-free zone is immediately adjacent to a given building and extends outward in all directions for a recommended minimum of 10 metres in flat terrain.

### Recommended guidelines for Priority Zone 1

Fuel removal and conversion are the principal vegetation management strategies in Priority Zone 1.

- This area must reduce the risk to buildings from approaching wildfire and reduce the potential for a building fire spreading to the wildland. The minimum distance between a building and untreated fuels should be 10 metres.
- Annual grasses within 10 metres of buildings should be mowed to 10 centimetres or less.
- Ground litter and downed trees should be removed annually.
- Overmature, dead, and dying trees with potential to ignite and carry fire should be removed.
- Owners are encouraged to convert remaining vegetation to less fire-prone species if consistent with ecological factors.
- Vegetation existing away from the immediate area of the building should be thinned and pruned to prevent a fire from being carried toward or away from the building.
- Where slope and aspect increase the hazard to

## WHAT IS A FUEL MODIFIED AREA ?

Fuel modified areas between a building and a potential wildland fire have combustible materials and vegetation removed, reduced or converted to reduce the potential for an advancing wildland fire to spread to the building or, conversely, for a building fire to spread to the adjacent wildland. Without fuel modified areas, fire intensity and rate of spread can make firefighting difficult or impossible.



Fire in the interface without fuel modification.



Fire in the interface with fuel modification.

▶ *Hazardous accumulation of ground-level fuels and debris.*

buildings and greenbelts, fuelbreaks should be provided.

- Structures adjacent to slopes without adequate setback will require increased fuel treatment distances. Where slope and aspect increase the hazard to buildings and greenbelts, fuelbreaks should be provided.

### Fuel removal in Zone 1

Removing flammable vegetation from around a building will reduce the fire danger. Fuel removal involves removal of ground-level fuels, piled debris, and other combustibles.

### Removal of ground-level fuels

Surface fuels range from downed tree trunks to needles and other forest litter. This accumulation of dead organic material and other vegetation is responsible for carrying a fire along the forest floor. This forest litter must be removed if the fire danger is to be reduced significantly.

Surface vegetation is considered **scattered** if groups of logs, branches, and twigs are widely spaced (e.g., separated by 3 - 5 metres or more). Surface vegetation is **abundant** if groups of logs, branches, and twigs are continuous or nearly continuous across the forest floor.

Removing surface fuels also reduces the probability that a surface fire will gain enough intensity to develop into a crown fire.

PHOTO: DON MORTIMER

▼ *A well-maintained lawn provides protection within Zone 1.*

PHOTO: BRIAN MOTTUS

### Recommended guidelines for removal of ground-level fuels

Remove downed tree trunks along with smaller branch materials. Reduce finer twigs, needles, and litter by raking into piles and burning or hauling away.

If it is feasible, prescribed burning of scattered fuels by fire specialists under controlled conditions can also accomplish adequate fuel removal. Check with local authorities for approval and a burning permit.

Remove small trees and shrubs. Flammable species such as juniper and pine trees or cured grasses are particularly hazardous. Keep grasses within 10 metres of the building watered and trimmed to less than 10 centimetres or replaced with non-flammable walkways, patios, or other landscaping materials.

**Note:** Fuel modification will result in increased

surface vegetation (grass and shrubs). These fuels will be more flammable but will burn with reduced intensity. Ongoing maintenance actions will be needed periodically to reduce surface fuel accumulations.

### Removal of piled debris and other combustibles

Firewood, building material or other combustible debris piles and wooden storage shacks or fences are all serious fire dangers. In case of wildfire these items will ignite and burn intensely. They are usually located near the principal building and are often responsible for igniting interface buildings during fire events.

Research indicates that neighboring structures are a significant potential ignition source due to radiant heat exposure, longer burning times, and the additional effect of firebrand production from burning structures.

### Recommended guidelines for removal of piled debris and other combustibles

Keep firewood, combustible debris, outbuildings and other structures at least 10 metres from the building.

We recommend that neighboring structures

PHOTO: STEW WALKINSHAW



be located at least 10 metres from the building.

Avoid locating combustible material downslope from the building. If this is not possible, increase the distance specified above.

### Fuel conversion — alternative vegetation

Fuel conversion is the removal of flammable species and the replacement of them with less flammable ones.

▲ *Improper firewood storage.*

◄ *Firewood stored away from building and decks.*

PHOTO: BRIAN MOTTUS

*Recommended guidelines for fuel conversion*

Plants that are low growing and woody or deciduous are referred to as low-fuel-volume plants. These plants are ideal replacements for more highly flammable species growing close to interface buildings, or in areas where a firebreak is planned.

The type of vegetation and topography in an area will determine the degree of management needed. Replace highly flammable species such as juniper or cedar adjacent to buildings with watered lawns and low-fuel-volume plants. Individual trees and shrubs may be kept, if this vegetation would not readily transmit fire to the building. Where slopes are involved, consider the stability of those slopes in any sort of vegetation management plan.

Different regions within Canada have different climates and soils that determine various vegetation management strategies. Nursery and landscape professionals often have recommended plant lists for specific regions of the country. Cross-referencing of these lists with the recommended guidelines of fire officials will enable homeowners to make a suitable conversion to fire-resistive plants.

In some locations, you may want to replace coniferous trees with deciduous trees.

*How to choose FireSmart vegetation*

In deciding which vegetation to remove, reduce, or replace in a program of fuel management, it is important to know the characteristics that make one species of vegetation more flammable than another.

The most flammable plants include those that rapidly accumulate quantities of dead foliage and branches, dead and diseased trees, vegetation with high oil or resin content, and plants that dry quickly in arid weather. When planting a new landscape, avoid choosing a species with these characteristics.

Most plants will burn under extreme fire weather conditions such as drought aggravated by high winds, but they will burn at different intensities and rates of spread. *Fire-resistive* plants burn at a relatively low intensity, with a low rate of spread. Interface residents should attempt to use fire-resistive vegetation when planting new landscapes.

**Important note:** Abnormal weather patterns can create problems with severe fire behavior occurring in normally fire-resistive vegetation. FireSmart recommended guidelines on fuel conversion and fire resistive vegetation are based on general principles and typical weather patterns.

## FIRE-RESISTIVE VEGETATION

Fire-resistive vegetation has these characteristics:

| CHARACTERISTICS | EXAMPLE |
| --- | --- |
| Accumulates minimal dead vegetation | Sparsely branched trees and shrubs |
| Non-resinous plants | Deciduous trees and shrubs |
| Plants with low volumes of vegetation | Younger, sparse growing trees and shrubs |
| Plants with high live fuel moisture | Succulent plants that retain a large amount of water |
| Drought-tolerant plants | Deeply rooted plants with thick, heavy leaves |
| Trees without ladder fuels | Deciduous trees or conifers pruned to two metres |
| Low maintenance vegetation | Slow-growing plants requiring little care |
| Plants with thick woody stems | Require prolonged heating to ignite |

## FIRESMART TREES

Use the table below to help you make choices during forest thinning, reduction and conversion operations.

| Tree species | Flammability |
|---|---|
| Aspen | Very Low |
| Birch | Low |
| Maple | Very Low |
| Poplar | Very Low |
| Black spruce | Very High |
| White spruce | High |
| Engelmann spruce | High |
| Jack pine | High |
| Lodgepole pine | High |
| White pine | Medium |
| Ponderosa pine | Medium |
| Western red cedar | High |
| Mountain hemlock | High |
| Western hemlock | High |
| Douglas-fir | High |
| Grand fir | High |
| Sub-alpine fir | High |
| Western larch | Low |

### Priority Zone 2: Area 10-30 Metres from a Building

The goal of vegetation management in Priority Zone 2 is to further extend the fuel modified area by reducing flammable vegetation with a variety of thinning and pruning actions.

### Recommended guidelines for Priority Zone 2

Priority Zone 2 should be an environment that will not support high-intensity crown fires. Surface fire may spread across this zone but it will be of low intensity and readily extinguished.

- Fuel reduction (rather than removal) is the main strategy for vegetation management in Priority Zone 2. Actions listed refer largely to coniferous (evergreen) forests or evergreens in mixed wood.
- Thinning of deciduous (e.g., aspen) forests or removal of deciduous trees within mixed-wood forests is discouraged. These forest types hinder fire spread during most times of the year.
- On flat terrain, Priority Zone 2 is concentric and 20 metres wide. It extends outward from 10 metres from the building walls to 30 metres from the facility.
- On sloped terrain, the width of Priority Zone 2 must be extended.
- Effective fuel management in Priority Zone 2 requires an extensive initial effort followed by an ongoing maintenance program.



PHOTO: JOHN LUCKHURST

### Fuel reduction in Zone 2

Reduction of flammable vegetation in Priority Zone 2 will further reduce the fire danger. Fuel reduction involves thinning the forest canopy, thinning understory, and pruning lower branches.

### Thinning the forest canopy in Zone 2

Thinning involves removing selected whole trees, especially highly flammable species and individuals. The goal of the thinning process is to leave a forest of more fire-resistive or separated trees. Separated trees are widely spaced and crowns do not touch or overlap. Separation of tree crowns reduces the probability of fire spreading laterally from one crown to another. Continuous trees are tightly spaced and crowns frequently touch or overlap.

### Recommended guidelines for thinning the forest canopy

- Thin stands of trees for a distance of two tree heights—at least 30 metres in each direction from the building if on level terrain.
- Remove concentrations of overmature, dead and dying trees, that have high potential to ignite and carry fire to the building.

### Thinning requirements and slopes

- Increasing slopes require increased treatment distances to be effective.
- Multiply recommended distances for level terrain by the factor shown in the following examples.

## THINNING REQUIREMENTS

Thin forest stands to reduce crown cover to less than 40 percent with at least 3 metres between crowns (up to 6 metres between crowns may be required in some situations). Crown cover is the percentage of ground area covered by tree crowns if viewed from above.



Before thinning

After thinning
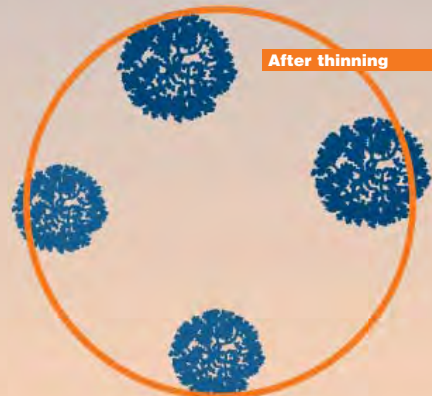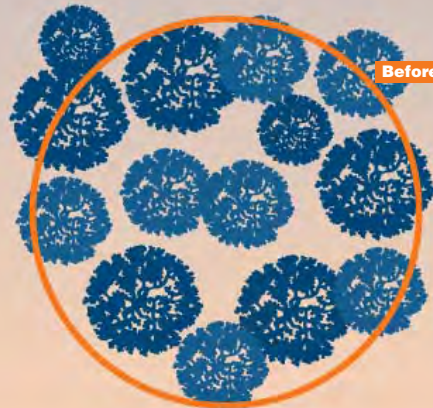
**Thinning reduces the crown cover of the forest**

## SLOPES



**Increasing slopes require increased treatment distances to be effective**

Flat terrain · 30% slope · 55% slope

Where slope below the building is 30 percent slope, fuel treatment distances (accomplished to 30 metres from the building on level ground) would increase by 2x to 60 metres downslope and by 1.5x to 45 metres horizontal. On a 55 percent slope the distance would increase by 4x to 120 metres downslope and by 2x to 60 metres horizontal.

**Note:** Thinning can result in additional tree losses because of wind damage if the original stand is very dense and the initial thinning process opens it too wide. To reduce this problem, we recommend a two-stage thinning. The initial thinning should remove one-half to two-thirds of the desired amount, followed by another removal five to 10 years later if needed. Generally, the largest trees will be the most windfirm and healthy, and should be kept.

### Understory thinning

Understory thinning involves removing all or most understory trees. An understory tree is an immature tree growing under the canopy of taller trees. The goal of the understory thinning process is to reduce the probability of surface fires climbing into the forest canopy.

### Recommended guidelines for understory thinning

- Remove all trees growing under the canopy of a taller tree (understory trees), although you may decide instead to remove the taller tree, depending on its health, shading, etc. If some of these understory trees are retained, they should not be left in clumps and should be at least 4 metres apart.
- Treatment distances from the building should be the same as those specified for overstory thinning.



**Before understory thinning**
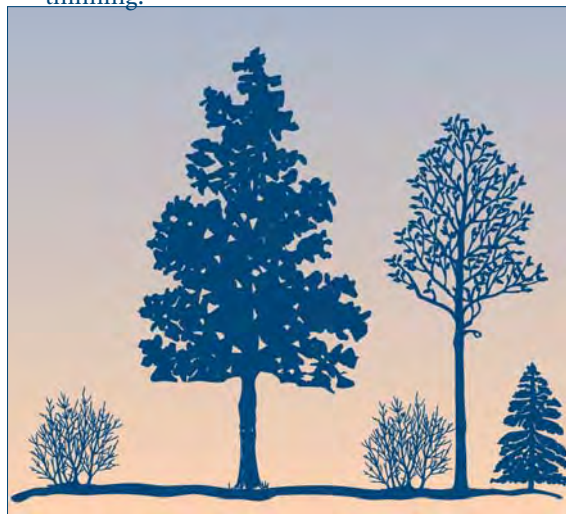


**After understory thinning**

Before



After



**Ladder fuels carry flames from surface fuels into the forest canopy.**



Minimum 2 metres
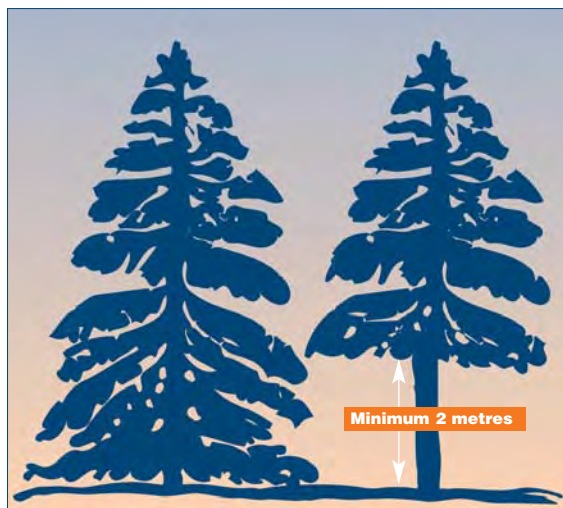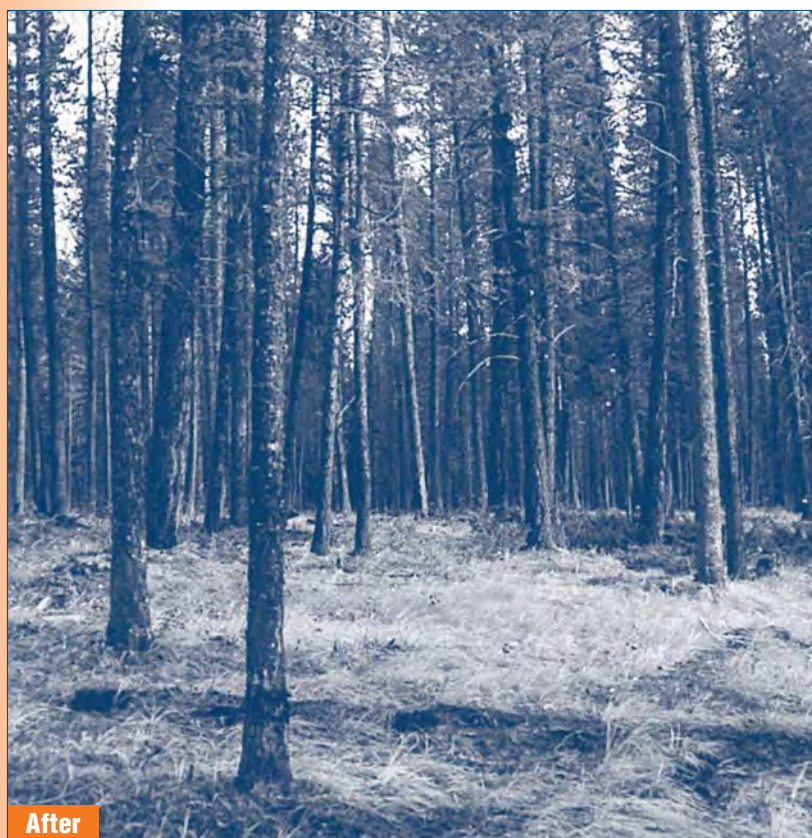
**Recommended pruning**

### Pruning lower branches

Pruning involves removal of lower branches of large trees and the litter that accumulates on them. This prevents flames from climbing, as if on a ladder, from the ground into the canopy above, which greatly increases the intensity of the fire. Pruning is especially important on conifers.

### Recommended guidelines for pruning lower branches

• Prune all conifers. Remove the live and dead branches at least 2 metres from the ground. This reduces the probability of surface fires spreading into the crown.

- Dispose of slash created by the thinning and pruning procedures promptly to avoid buildup of fire hazard and destructive insect activity such as bark beetles.
- There are some exceptions. Pruning in pine stands with a low percentage of spruce and fir trees may be limited to the pine trees. In these situations, pruning of spruce, fir or isolated trees may not be recommended for aesthetic reasons. The unpruned trees will be more likely to candle, so it is important to remove adjacent trees to avoid crown fire.
- Lower branches of spruce and fir may need pruning in some areas. Young trees less than 8 metres high could be left unpruned but additional space should be provided around them. This ensures sustainable forest cover as young trees gradually replace the older ones.

### FireSmart techniques for fuel removal and fuel reduction

There are several ways of reducing the hazards presented by excess fuels.

- **Hand clearing** is the most common method. Tools include rakes, axes, shovels, and pruning saws.
- **Mechanical** methods quickly reduce or remove large amounts of flammable vegetation. Tools and machinery include tractor and disk, lawn mower, chipper, and the power string trimmer.
- **Prescribed burning** is the application of fire to natural or managed vegetation under controlled conditions in order to burn flammable vegetation. Prescribed burning should only be done by fire protection professionals in compliance with local policies and regulations.
- **Watering** landscapes and vegetation close to interface buildings is recommended during prolonged drought.
- **Grazing** by domestic animals is a simple and often overlooked method for reducing grasses, shrubs, and other low-growing vegetation.

## Priority Zone 3: Area 30 – 100 Metres from a Building

This area begins 30 metres from the building and extends to 100 metres or farther from the building. The strategies and standards for vegetation management in Priority Zone 3 are similar to those applied in Priority Zone 2. For information on these, see Priority Zone 2 (Page 3-9).

### Recommended guidelines for Priority Zone 3

- Fuel management measures in Zone 3 should create an environment that will not support high-intensity crown fires. Fire may spread across this zone but it should be of low intensity and more readily extinguished.
- Fuel management in this area is required where there are high hazard levels resulting from heavy continuous forest vegetation and steep topography, and the hazard is not reduced to desired levels by fuel management in Priority Zone 2.
- Fuel reduction and conversion (rather than removal) are the principal vegetation management strategies in Priority Zone 3.
- Keeping deciduous (e.g., aspen) forests and deciduous trees within mixed-wood forests is encouraged as these forest types hinder fire spread during most times of the year.
- On flat terrain, Priority Zone 3 is concentric and extends outwards beginning 30 metres from the facility walls and ends 100 metres from the facility.
- On sloped terrain, the width of Priority Zone 3 must be extended further downslope.
- Effective fuel management in Priority Zone 3 requires an extensive initial effort followed by an ongoing maintenance program.

## Fuel Modification for Communities: Community Fireguards

Fuel modification concepts can also be applied to towns, villages, large facilities, or groups of buildings that interface with continuous forest fuels. In this situation, a community fireguard should be installed. A community fireguard is a wide area in which a combination of fuel management strategies and the standards described for Priority zones 1, 2

# What About Wildlife?

Many of the vegetation management actions taken to reduce the risk of wildfire losses also make changes to the character of wildlife habitat surrounding homes or communities.

How does fuel reduction affect wildlife and what can you do to avoid unnecessary impacts or even improve opportunities for wildlife in your neighborhood?

Here are some important considerations and useful tips:

- In some locations, forest openings and areas of less dense forest canopy were more common in the past. Reducing the forest density may actually help restore habitat qualities that are now in short supply and critical to some species.
- Thinning the forest canopy allows more sunlight to reach the ground and may result in additional plant growth (e.g., grasses fed on by deer, flowering plants for insects).

- Leaving some decaying logs and litter on the forest floor provides habitat for small mammals and insects that are fed upon by birds and other wildlife.
- Large-diameter snags (standing dead trees) are potential wildlife trees. Leaving occasional snags provides nesting sites and perches for a wide array of resident and migratory birds — as well as squirrels and bats.
- Preserving deciduous shrubs and a scattering of younger trees provides greater diversity in the forest layers, providing hiding cover for wary wildlife and feeding opportunities for others.

Currently, research is underway to identify innovative, ecologically based methods for managing forest fuels in ways that reduce wildfire risk but also optimize or improve ecological conditions, wildlife habitat, and aesthetic qualities in the interface. Homeowners can be both FireSmart and ForestWise.

PHOTO: JOHN LUCKHURST

PHOTO: PARKS CANADA

# WHAT IS A COMMUNITY FIREGUARD?



**Fuel breaks**
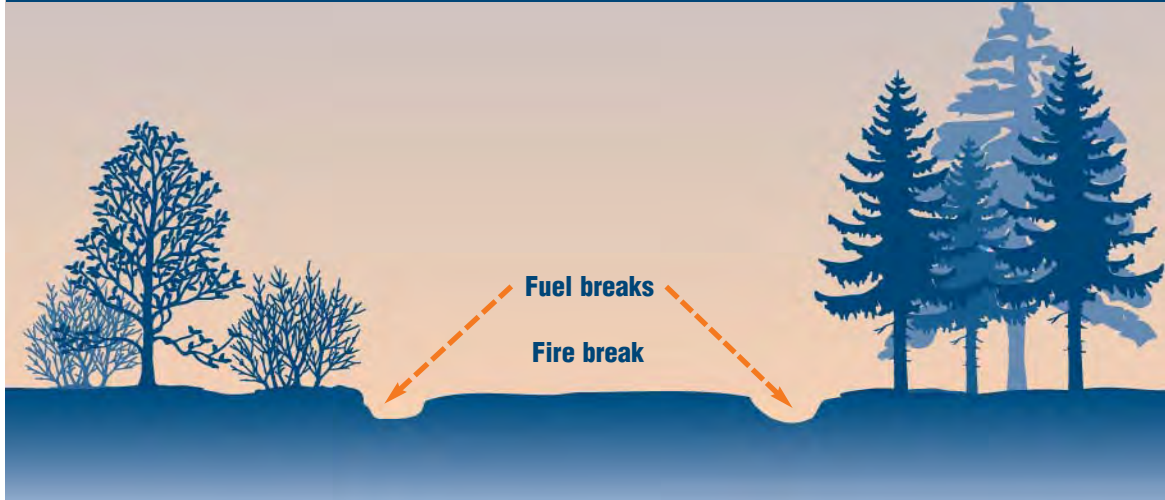
**Fire break**

**The community fireguard incorporates both fire breaks** and **fuel breaks**. Fire breaks are barriers to fire spread built by clearing or significantly thinning fuels on a strip of strategically located land. Fuel breaks are trenches dug down to mineral soil that stop surface fire spread.

# FIRE BREAK GUIDELINES

1. The width of the fire break will vary with the slope.

   Slope/Width of Fire break
   0 - 5 %        30 m
   5 - 15 %       40 m
   > 15 %         50 m



30 metres — 0 – 5% slope
40 metres — 5 – 15% slope
50 metres — >15% slope
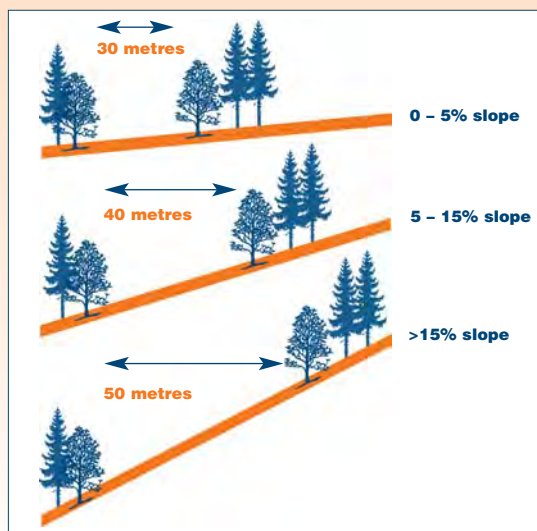
2. Widen the fire break where gullies and terrain variations increase the slope.

3. Remove, reduce, or convert vegetation within the entire width of the fire break to a less aggressive standard for at least 5 metres on both sides of the fire break. Increase this 5-metre zone to 10 metres or beyond where high fire behavior levels are anticipated. Vegetation management should meet the same minimum standards as are used for the Priority zones 1 and 2.

4. Build a fuel break on both sides of the firebreak. The fuel break should be one metre wide, dug down to mineral soil and water-barred where needed. (Water bars are channels built across the exposed soil of the fuelbreak perpendicular to the slope—channelling runoff water before it can rush down the hill causing excessive erosion or gullying.)

▲ *Community fireguard integrated with public green space and trails.*

PHOTO: NFPA

as a fuelbreak and will increase firebreak effectiveness, if it is necessary to keep ground cover intact for aesthetic or other reasons. If fuelbreak construction is not feasible during initial establishment of a firebreak, remove surface fuel to a more aggressive standard.

To build a community firebreak, outline the proposed area on a map. Everyone within the community who will be affected should meet to decide where and how much fuel modification is needed. Then the boundaries can be marked with flags in preparation for the physical work of constructing the firebreak. The community side of the firebreak should follow the lot boundaries and be as straight as possible. The boundary on the forest side of the firebreak will vary with the slope and any other special concerns. If the firebreak is to be built on an individual lot, the boundaries of the firebreak should follow the property stakes.

Ideally, all properties adjacent to continuous forest fuels will have a firebreak. Firebreaks should be built to the following standards:

### Disposal of Forest Debris

Vegetation management can produce a tremendous amount of material requiring disposal. If this combustible material is left on site, it will create additional fire danger. Use one or more of these methods to dispose of combustible debris:

### Landfill disposal

Taking the debris to an authorized landfill site has the advantage of removing the material from the site completely. On the downside, the cost of hauling to a landfill site is high and the large volumes of forest vegetation will quickly fill landfill sites.

### Composting

This is a good choice to reduce costs by minimizing hauling and landfill use. It also eliminates the smoke emissions and environmental damage of burning and allows the nutrients in the material to be recycled. On the downside, the composting material remains on site. Another disadvantage is that coniferous forest litter takes many years to decompose. Deciduous litter and grass clippings decompose quickly and are the best materials for composting.

An alternative to on-site composting of forest litter is a community composting program. A cen-

and 3 have been applied.

To appreciate the importance of community fireguards, recall that large wildfires are often spread by embers lofted up to one kilometre in advance of the main fire front. Although the fireguard forms one line of defence, it is by no means a fail-safe blockade to wildfire. A fireguard also provides firefighters a place to stage more aggressive fire control tactics.

Even with a community fireguard, buildings within the community will still need to maintain fuel modified areas.

A trail bed for hiking or horse use will also act

tralized composting area is built within an interface neighborhood and run by volunteers or a community organization. Program operating expenses can be defrayed by the sale of high-quality, composted soils to the community.

### Chip and spread

A mechanical chipper can process slash into chips that are then spread over the ground. Chipped slash decomposes more rapidly and will present little fire danger (as long as chips are not spread too thickly). Chips act as mulch to hold soil moisture, stimulate plant growth and prevent erosion on slopes. The disadvantages to this system of slash disposal are the very high costs. If the chips are spread too thickly, the fire danger remains high and plant growth is slowed.

### Salvage

Timber or firewood-sized material can be separated and used by residents. The remaining material should be disposed of safely. Firewood piles are easily ignited during interface fire events. Locate them at least 10 metres from buildings and never downslope.

### Pile and burn

Under the right fuel moisture and weather conditions, piling and burning debris can provide a very effective reduction to the on-site fire danger. To reduce smoke production, the material to be burned must be as dry as possible. To dry the fuels, rake or throw them into burnable-sized piles away from standing trees and leave them to air dry. Never burn green or freshly cut fuels because of their high moisture content.

Ideally, burn piles only after materials have dried for at least one season and after a period of dry weather. The best burning conditions usually occur between noon and four o'clock in the afternoon, under light to moderate wind conditions. As air movement is needed to disperse the smoke emissions, avoid burning in the mornings or evenings, during temperature inversions, or on very calm



◄ *Thinning pine stand with pile and burn technique.*

PHOTO: PARKS CANADA

days. Stable air does not allow effective smoke dispersion so that the burning affects local air quality.

For the best burning results, with minimal smoke production, start a small, hot-burning fire and then build on to it, maintaining the fire intensity. Residents with smaller quantities of debris to dispose of may choose to use burning barrels, which reduce the chance of fire spreading into adjacent fuels.

Extinguish all burning material once the fire is down to a smoldering state. Smoldering fires produce the most smoke and should be avoided. Monitor fires closely at all times—unattended fires pose a hazard to nearby houses and forests.

Before igniting a fire within municipal limits, contact your fire department to ensure that you comply with all local by-law requirements. Rural home-owners usually require burning permits from local authorities.

### Maintaining thinned forests

Firebreak effectiveness tends to decrease over time. After the initial vegetation management, trees will continue to grow, usually at a faster rate. The increased light on the forest floor encourages heavy grass and brush growth where, in many cases, nothing grew before. Site disturbance exposes mineral soil, which creates a seed bed for new trees. This in turn leads to new opportunities for fire.

Some species of trees are easily felled by winds that penetrate the forest cover more easily after the original clearing and thinning has been done.

An interface building or community will not continue to be FireSmart without occasional maintenance of previously treated areas. Fuelbreak maintenance problems are most often the result of neglect. During years of low fire incidence, residents may become complacent about vegetation management.

Fire officials and fire prevention specialists trained in interface fire hazard assessment and mitigation should periodically inspect interface buildings to ensure fuel modified areas still meet FireSmart recommended guidelines.

*▶ Periodic maintenance of community fire guards is essential.*

*▼ A fuel modification project in Banff.*
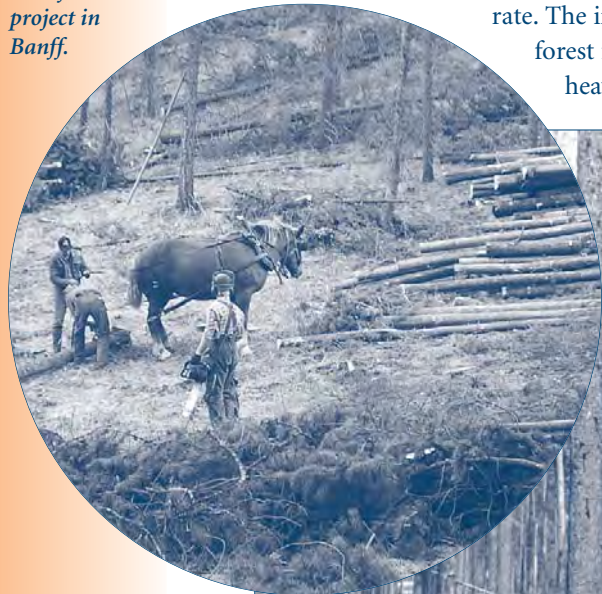
*▶ Fuel reduction completed.*

PHOTO: BRIAN MOTTUS

PHOTO: PARKS CANADA

PHOTO: KELVIN HIRSCH

# STRUCTURAL OPTIONS

This section outlines FireSmart design standards recommended for the construction or retrofit of interface buildings. As the hazard of wildfire destruction in the interface is more widely recognized, the safety of buildings will become a higher priority than before.

There will be a legislated, or market-driven, demand for FireSmart principles to be reflected in the design, construction, and maintenance of an interface residence or community. Fire officials, interface architects, contractors, developers and owners can use the options and recommended guidelines provided here to build FireSmart buildings and communities. Where local building codes, development bylaws, or covenants exceed the standards recommended in this manual, follow local codes and bylaws.

Others involved with the construction industry, including manufacturers, real estate professionals, inspectors, building material suppliers, insurers and mortgage lenders, should be informed about what can be done to reduce the vulnerability of buildings to wildfire. Fire officials and municipal planners will increasingly be called on to provide informed and unbiased advice to these individuals and organizations.

## Roofing

Although many factors contribute to the ability of a building to withstand an interface fire event, roofs that catch fire are the main cause of building losses in wildland/urban interface areas. The roof is the



PHOTO: DAVE BROWN

most vulnerable component of the building. Its more-or-less horizontal surface catches and holds much of what falls on it. Firebrands and flaming debris generated by large fires can travel great distances. Once airborne, these brands are pushed by prevailing winds or driven aloft great distances by the fire's convection column. The firebrands respect no boundaries and jump over built and natural fuel-breaks to ignite spot fires.

Firebrands landing on a combustible roof surface will often start a new fire. This new fire, in turn, may produce more airborne firebrands (particularly if the roof is built of untreated wooden shakes).

### Roofing classifications for combustibility

Building codes have long recognized the role of roofing in the spread of fires. Building codes apply the roofing classifications A, B and C, based on the combustibility of the exterior roofing surface.

Wooden shakes can only provide an A-, B-, or C-rated roof level of fire protection if they are pressure treated in the factory with a fire-retardant chemical. The treated shakes receive a B or C rating and can then be incorporated into a Class A-, B-, or C-rated roof structure. Some manufacturers offer lifetime warranties on the fire-retardant qualities of their product.



PHOTO: BRIAN MOTTUS

◀ *Wooden shakes can only provide an A-, B-, or C-rated roof level of fire protection if they are pressure treated in the factory with a fire-retardant chemical.*

▶ *Roofs that catch fire are the main cause of building losses in wildland / urban interface areas.*

PHOTO: PARKS CANADA



# TESTING FOR COMBUSTIBILITY

Testing involves burning wood cribs or brands of varied sizes placed on the roof surface to test the combustibility of roofing materials. This simulates the spotting of firebrands and flaming debris so typical of wildland fires.

To attain a Class A rating, a test roof must remain unburned after the largest brand is placed on the roof and allowed to burn itself out.

Smaller brands are used to help determine B and C ratings.

*Underwriters' Laboratories of Canada (ULC) rated Class A roofing material test is wood cribbing material of kiln-dried, knot-free Douglas-fir. Wood crib dimensions are 305mm square and about 57mm high. Wood crib is three layers of 12, 19mm by 19mm by 305mm strips, arranged 12mm apart, nailed at each end. Each layer is stacked 90 degrees to adjacent layer.*
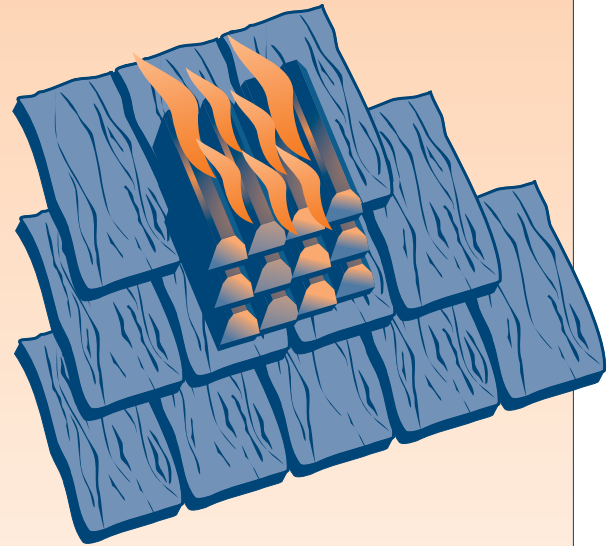
| Rating | Class A | Class B | Class C |
|---|---|---|---|
| Fire Resistance | High | Moderate | Low |

PHOTO: DAVE BROWN

## COMMON ROOF TYPES AND FIRE RATINGS

| Type | Fire Rating | Advantages and Disadvantages |
| --- | --- | --- |
| Clay Tile | Class A | Durable but fragile. Heavy tiles need strong framing. (Can re-roof on standard framing with bracing). |
| Concrete Tile | Class A | Weight/breakage challenge as with clay tile. (lightweight concrete tile available) |
| Fibreglass / Asphalt Composition Shingles | Class A | Easy to apply, most common and economical of A-rated roofs.<br><br>Some homeowners associations have covenants forbidding use. |
| Metal Roofing | Rating requirements vary:<br><br>Class A – if old roof removed.<br><br>Class B – installed with heavy roofing paper over old roof.<br><br>Class C – if applied directly over old roof. | Lightweight and durable, wide color range. Some designed to simulate shake roof appearance. |
| Fibrous Cement Shake | Rating requirements vary:<br><br>Class A – if installed over plywood.<br><br>Class B – if not installed over plywood. | Lightweight and durable. Best simulation of shake and slate appearance. No roof reinforcement needed. |
| Built-up Roof | Rating requirements vary:<br><br>Class A – 9 layers of roofing felt.<br>Class B – 7 layers of roofing felt.<br>Class C – 3 layers of roofing felt. | Standard tar and gravel flat roof, inexpensive. Unless done properly, no rating secured at all. (Asphalt or paper felt placed over wood with insufficient top coating is very flammable). |
| ULC Rated Shakes | Rating requirements vary:<br>Class A – 'B'-rated shakes over roof deck<br>Class B – 'B'-rated shakes over sheathing.<br>Class C – 'C'-rated shakes over lathing.<br>**No other shakes meet fire ratings.** | Must be kept clean. Moss, needles and other debris increase fire danger. |
| Unrated Shakes | None | Untreated shakes (or those with spray-on fire-retardant treatments) are highly combustible. |

▶ *Metal roofing, slate, tile (clay or concrete), composition (asphalt and fibreglass shingle) and treated wooden shakes all provide increased fire resistance.*

PHOTO: KELVIN HIRSCH

There are other FireSmart roofing options. Metal roofing, slate, tile (clay or concrete), composition (asphalt and fibreglass shingle) and treated wooden shakes all provide increased fire resistance. Whatever material you choose, it must be installed in compliance with local building codes to achieve the fire resistance of an A-, B-, or C-rated roof.

Wooden shakes remain extremely popular with interface homeowners and designers. Some agencies and interface developments have imposed restrictive covenants or ordinances that require buildings to be roofed with wooden shakes without imposing a recommended minimum rated roof standard. The result of this type of covenant is that some buildings may have rated roofs while others will only have untreated wooden shake roofs.

Fire officials should work with local governing bodies to implement policy changes so that building material requirements in interface areas are based on fire hazard rating, not aesthetics. Municipalities should consider modifying policies to require at least a Class C level of protection for roofing materials used in new construction in interface areas.

*Recommended guidelines for roofing*
- Use only fire-retardant roofing rated Class A, B, or C. Use fire hazard severity classifications as determined by fire officials to determine specific rating requirements.
- Clear roofs of all overhanging branches or needles and combustible debris buildup on roof surfaces or in gutters. When needles and debris begin burning on the roof surface even fire-resistant materials will ignite.

## Chimneys or Stovepipes

Many interface buildings feature wood stoves or fireplaces as principal or auxiliary heating systems. Chimneys present a serious hazard in interface areas if they are not equipped to prevent firebrands or embers from escaping.

### Recommended guidelines for chimneys or stovepipes

All chimneys used with solid or liquid fuel-burning devices should have approved spark arrestors. Arrestors must be securely attached and made of 12-gauge welded or woven wire mesh screen with mesh openings of less than 12 millimetres. Chimney outlets should have at least 3 metres' clearance from all vegetation and obstructions. Chimney outlets must be .6m higher than any part of the roof that is within 3m.

## Exterior Siding

After the roof, siding material is the structural component most vulnerable to fire. An interface fire burning the forest and vegetation surrounding a building will produce intense heat that can result in exterior ignitions. Airborne firebrands and embers will travel on the high winds that often accompany wildfires. Lodging in and against the



≥ 3 metres

≥ 3 metres from nearest vegetation

≥ .6 metres
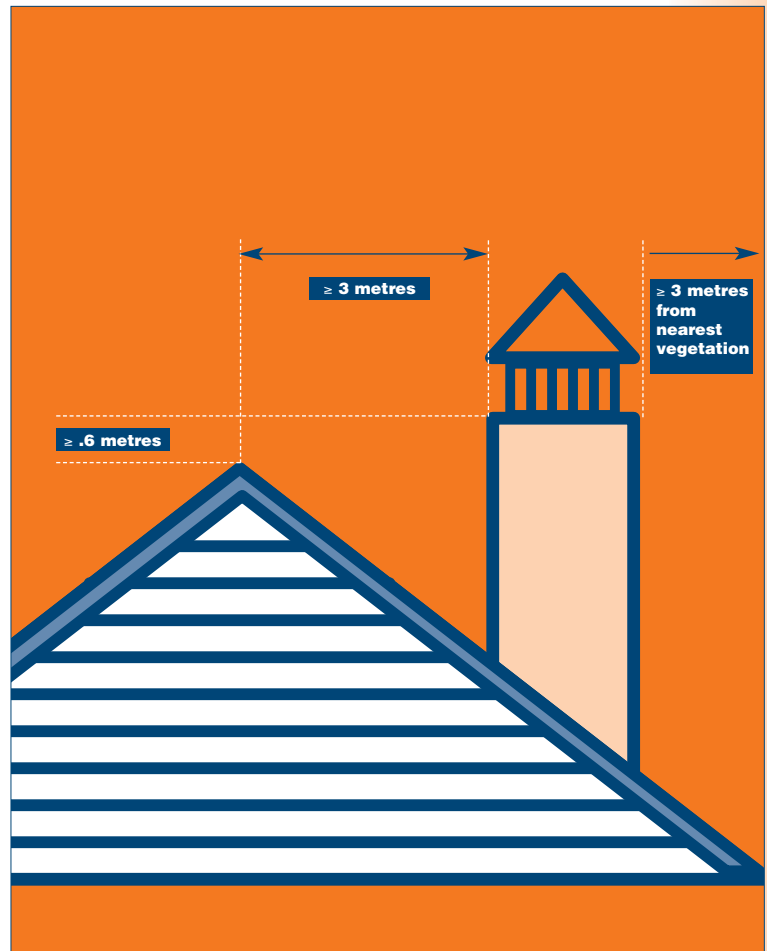
PHOTO: KELVIN HIRSCH

structural exterior, these firebrands are a major source of building ignitions.

When siding material is combustible, whether the building survives will depend on how easily the building exterior can be ignited. Vegetation or combustibles close to the building exterior or exterior wall features that can trap accumulations of embers will increase the ignition hazard to structures during a fire passage.



PHOTO: PELLA WINDOWS

Materials such as stucco, metal siding, brick, cement shingles, concrete block, poured concrete and rock offer superior fire resistance. Logs or heavy timbers provide a more fire-resistant building exterior than board siding. Vinyl siding may melt, exposing flammable sheathing.

Wooden siding offers very little fire resistance yet is commonly used in interface areas. Untreated wooden shakes or tarpaper used as siding material provide no fire protection and actually increase the hazard. Residents can increase the fire resistance of a wood-sided building by eliminating areas on the siding surface where sparks and embers will lodge. Exterior vertical walls should be sheathed from ground level to roof line with material that is at least 12 millimetres thick.

### Recommended guidelines for exterior siding

Any material used for siding purposes should be fire resistant, such as stucco, metal siding, brick, cement shingles, concrete block, poured concrete and rock. Siding material should be at least 12 millimetres thick and extend from ground level to the roofline.

## Window and Door Glazing

Glass shattered by fire creates an opening in a building exterior that allows firebrands to enter the building so that it burns from the inside. Clear concentrations of fuels within 10 metres of windows and glass doors.

Small or multiple-pane windows are less vulnerable to breakage than large panes. Single-pane windows fracture and collapse more easily than double- or triple-pane windows. Tempered glass provides more safety than plate glass does. It is highly unlikely that an interior will ignite from thermal radiation through intact plate glass.

For more effective fire protection, windows and other openings should have solid shutters. Ideally, these will be made of non-flammable material, although 12-millimetre **exterior-grade** plywood can be used. An alternative protective measure is to screen all glazed openings with corrosion-resistant, 3-millimetre wire mesh.

During fire season, store screens and shutters where they are easily reached for installation before fire approaches the building.

### Recommended guidelines
### for windows and door glazing

- Clear concentrations of vegetative fuels that are within 10 metres of glazed openings unless there are solid shutters to cover the glazing.
- Greater protection is provided by smaller (less than 1 metre by 1 metre) thermal pane, tempered glass windows. Larger windows provide less protection. Single-pane glass provides virtually no fire protection.
- Solid shutters will provide increased fire protection. They should be made of non-flammable material, although 12-millimetre exterior-grade plywood can be used.
- In the absence of shutters, exterior metal fire-screens with corrosion-resistant mesh no coarser than 3 millimetres will prevent firebrands from accumulating on windowsills and then igniting walls.
- Store screens and shutters where they can be installed quickly, before fire approaches the building.

## Eaves, Vents, and Openings

While vents perform the important function of allowing trapped moisture to escape from attics, soffits and crawlspaces, they are ready-made openings that can allow heat and embers to enter a building and ignite it.

### Recommended guidelines for eaves,
### vents, and openings

To prevent entry of windblown embers, all eaves, attic and underfloor openings need solid, non-flammable, exterior protective shutters. Fire shutters can be made of 12-millimetre exterior-grade plywood. Store screens and shutters where you can reach them easily for quick installation in case of fire. As a minimum protective measure, all openings should be screened with corrosion-resistant, 3-millimetre non-combustible wire mesh.

Provide interior access to attics and crawlspaces so homeowners can find and extinguish spot fires following the passage of the fire.



PHOTO: JOHN LUCKHURST
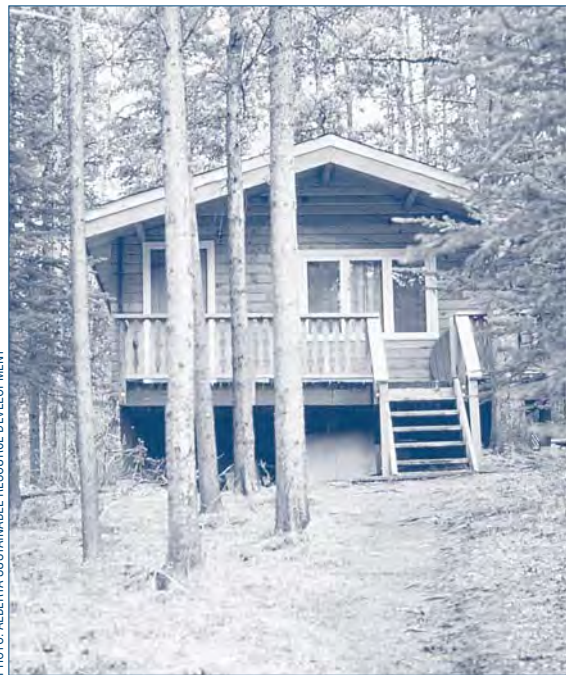


PHOTO: ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT

## Balconies, Decks, and Porches

Outdoor living areas are important to the interface lifestyle. It is unlikely that homeowners will be willing to eliminate stilt construction and overhangs used in the assembly of decks and balconies, despite the fire danger they create by trapping heat rising along exterior siding.

Stilt construction allows fire to get under overhangs and ignite the building. If vegetation, debris, or stored combustibles are allowed to accumulate under the overhang, the fire danger is further increased. Fortunately, there are ways to reduce the fire danger of these building features.

### Recommended guidelines for balconies, decks, and porches

Build balcony and deck surfaces of non-combustible or fire-resistant materials. Enclose eaves, cantilevers, balconies, and undersides of overhangs that are built of combustible material with 12-millimetre sheathing. Ideally, sheathing material should be non-flammable.

Stilts can be built from or encased in non-combustible materials. Use of heavy timbers instead of 2x4s will increase the fire resistance of the building.

Slotted deck surfaces allow needle litter to accumulate below the deck. Provide access to these spaces so that debris may be removed on a regular basis.

### Trailers and Manufactured Homes

Manufactured homes have many of the fire dangers outlined for other buildings. Although roofs and siding are usually metal and non-combustible, storage sheds or porches made of wood and plastic are common, and increase the fire danger.

### Recommended guidelines for trailers and manufactured homes

All the specific vegetation management and structural option recommended guidelines that apply to conventional homes in the interface also apply to making trailer and manufactured homes FireSmart. Areas under a trailer or manufactured home should be sheathed with non-combustible materials. This will prevent buildup of flammable material and prevent firebrands from blowing in under the unit.

If the installation is to be mobile or semi-permanent, provide adequate tie-downs. Many mobile-home fires are caused by movement of the home, which can damage electrical and gas service connections and cause fires.

▶ *Areas under a trailer or manufactured home should be sheathed with non-combustible materials.*



PHOTO: DON MORTIMER

## On-site Firefighting Equipment

Interface fires often start as small accidental ignitions, and timely action by properly equipped residents can make the difference between a fire that escapes and a fire that is quickly controlled. Homeowners are not encouraged to attack large or fast-moving wildfires.

Homeowners should have a round-point shovel and a grubbing tool readily available from the outside of the home. A lack of available tools greatly reduce the chance of interface residents successfully suppressing small fires in time. A small amount of water can cool or extinguish small fires close to buildings. Water should always be readily available during any backyard burning, in any weather.

Exterior faucets and garden hoses long enough to reach around all buildings and onto the roof will help the homeowner protect the house. Houses without pressurized water systems should have a minimum 205-litre (45-gallon) fire safety water barrel close to the building, with a 10-litre (two-gallon) pail attached. Reserve this water for fire protection.

A rooftop access ladder and rooftop sprinkler are useful for fighting rooftop fires or wetting down the roof if a forest fire is advancing on the house, although high winds may blow the water away before it contacts the roof. The sprinkler can be left running on the roof if residents have to evacuate, but use caution; getting to rooftops in windy, smoky conditions can be hazardous.

Household water supplied by electric pump is unreliable; power outage often accompanies forest fire incidents. Household water obtained from a community water main is also unreliable as demand often exceeds supply during a fire. More information on firefighting water supply considerations is provided in the next section.

### Recommended guidelines for on-site firefighting equipment

Keep a shovel and a grubbing tool readily available from the exterior of the building during fire season.

Maintain a water supply at exterior faucets with adequate hose length to reach around the building and onto the roof during fire season.

If your house does not have a pressurized water system, keep a water-filled 205-litre fire safety water



PHOTO: JOHN LUCKHURST

## SPRINKLER SYSTEMS

Sprinkler systems are a simple, effective, and safe tool to use in protecting structures in the interface from wildfire. They wet down the structures, which reduces the threat of ignition from firebrands. Sprinkler systems also help cool the buildings during exposure to radiant heat from wildfire. Wetting down the areas surrounding the structures increases relative humidity in immediately adjacent areas and reduces the fuel available for ignition around the structure.

barrel close to the building, with a 10-litre pail attached.

Keep a rooftop access ladder and rooftop sprinkler system available during the fire season.

▲ *Adequate hose and rooftop sprinklers are essential.* ▼



PHOTO: RAPID FIRE AND RESCUE SERVICES

# Infrastructure

This section looks at the network of roadways, open spaces, water supply, and utilities that make up the infrastructure of an interface community. FireSmart infrastructure cannot increase the probability of structural survival (this is determined by vegetation management and the use of FireSmart structural options). FireSmart infrastructure will, however, increase resident and firefighter safety and facilitate quick response by firefighters.

Firefighters in the wildland/urban interface are already working at a disadvantage, without an inadequate water system or narrow roads, steep grades, and underbuilt bridges.

Infrastructure problems within the interface community are potentially hazardous for both residents and firefighters. Many incidents resulting in tragic and costly losses can be blamed on substandard water supply, or inadequate access and evacuation routes.

## Access Routes

Roads serve several purposes during an interface fire. Roads are access routes for emergency vehicles, many of which are heavy and large. A fully loaded fire truck can weigh up to 20 tonnes.

Roads are also escape routes for residents during a fire, and need to provide safe simultaneous access for emergency vehicles and public evacuation. Roads may serve as firebreaks to provide fire protection and assist firefighting efforts in the interface.

Narrow driveways or dead-end roads without cul-de-sac turnarounds are a particular problem for fire trucks that may be unable to turn around when needed. This means the fire truck must make a backing exit that is slower and dangerous. Wherever possible, buildings should have alternate access routes provided to facilitate emergency evacuation if approaching fire blocks principal access routes.

Street signs and house numbers that are hard to see in dark or smoky conditions can result in access delays for firefighters. Combustible signs are not reliable as they may not survive even low-intensity ground fire.



After

Before

PHOTO: NFPA
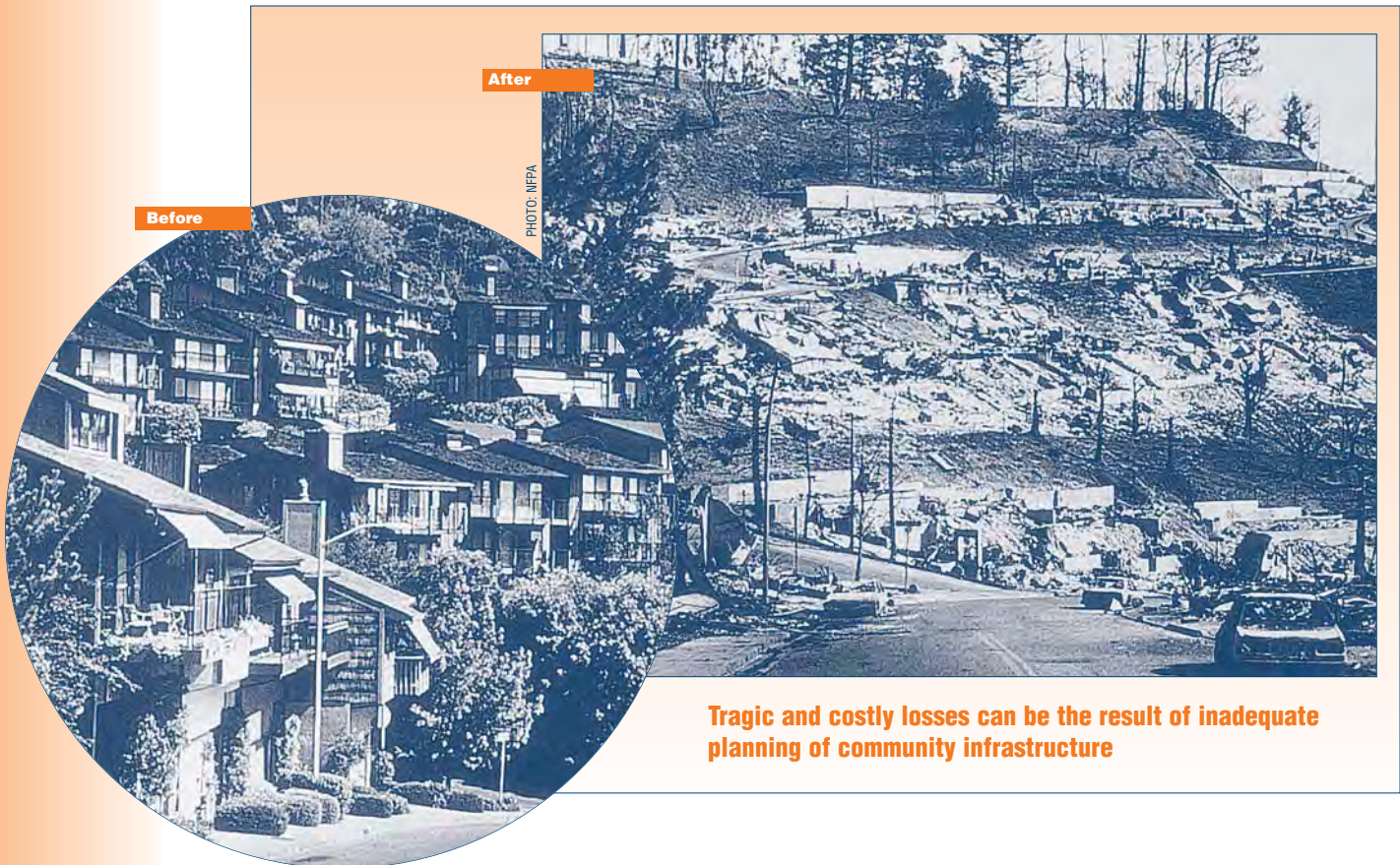
**Tragic and costly losses can be the result of inadequate planning of community infrastructure**

# ACCESS ROUTES



**Inappropriate dead-end access**
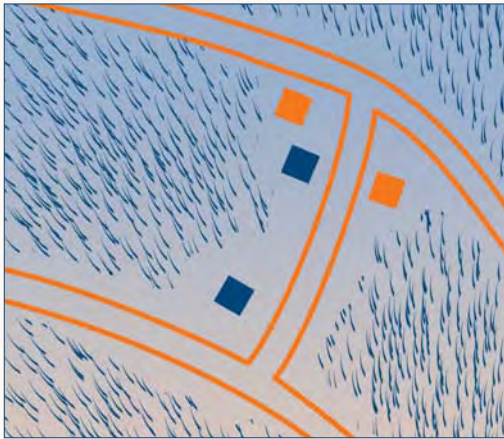


**Two-way access**

Access routes should be designed using looped networks capable of accommodating two-way traffic. All developments should have at least two access routes.

For interface fire protection purposes, access route standards are divided into two categories: road standard, for an access route that serves more than one parcel; and driveway standard, for the route to a building that is located more than 45 metres off a road. Wherever possible, road access routes should also work as perimeter firebreaks to provide fire protection and assist fire suppression efforts in the interface.

### Recommended guidelines for roads

The following recommended guidelines are for use in the layout, design, construction, and maintenance of both roadways and fire service access routes. Access routes built and serviced to these standards will facilitate safe and efficient access for both residents and firefighters.



PHOTO: JOHN LUCKHURST

**Road Standards**

Vegetation trimmed to <10 cm.

Where parking is allowed, increase shoulder width to 2.75 metres or increase road width by 2.7 metres

Road 6.1 metres

- Roads should provide safe simultaneous access for emergency vehicles and public evacuation with a traveled way of not less than 6.1 metres horizontally and 4.1 metres vertically. Where parking is permitted, an additional 2.7 metres of improved road width should be provided.
- Road curvature radius should be at least 30 metres, measured from the centre line.
- Road gradient should not exceed 10 percent. Exceptions to this may be negotiated with fire officials.
- Dead-end roads more than 90 metres in length should be provided with a turnaround at the terminus having no less than 36 metres outside diameter of traveled way. Fire officials may authorize a "hammerhead T" turnaround to provide three point turnaround ability. Dead-end roads should have their non-through traffic status posted.
- All gates should be located at least 9 metres from the public right of way and should not open outward. Gate openings should provide a clear opening of not less than .6 metres wider than the travelled way.
- Fire service personnel shall be provided with ready access to any locking mechanism on any gate restricting access to any road.
- Roads should have a hard all-weather surface capable of supporting any fire apparatus likely to be operated on the road.
- Bridges should be designed and built with a hard all-weather surface capable of supporting the heaviest piece of fire apparatus likely

to be operated on the bridge. Load limits should be clearly posted at the approaches to each bridge.

*Recommended guidelines for fire service access driveways*

- Driveways more than 45 metres in length should be a minimum of 3.7 metres in width and provide 4.1 metres vertical clearance over the full width. Fire officials may specify additional width and clearance.
- Turnouts shall be spaced so that drivers can see from one turnout to the next. Turnout requirement is waived where the fire service access width is 6.1 metres or more. Driveways more than 90 metres in length should be



PHOTO: KELVIN HIRSCH

▶ *Dead-end roads should be posted as no-through roads.*

## Road Standards



**'Hammerhead T' dead-end – alternative where acceptable to fire officials**

**18 metre radius if dead-end is >90 metres from road**

**Road 6.1 metres minimum width**

**30 metre radius**
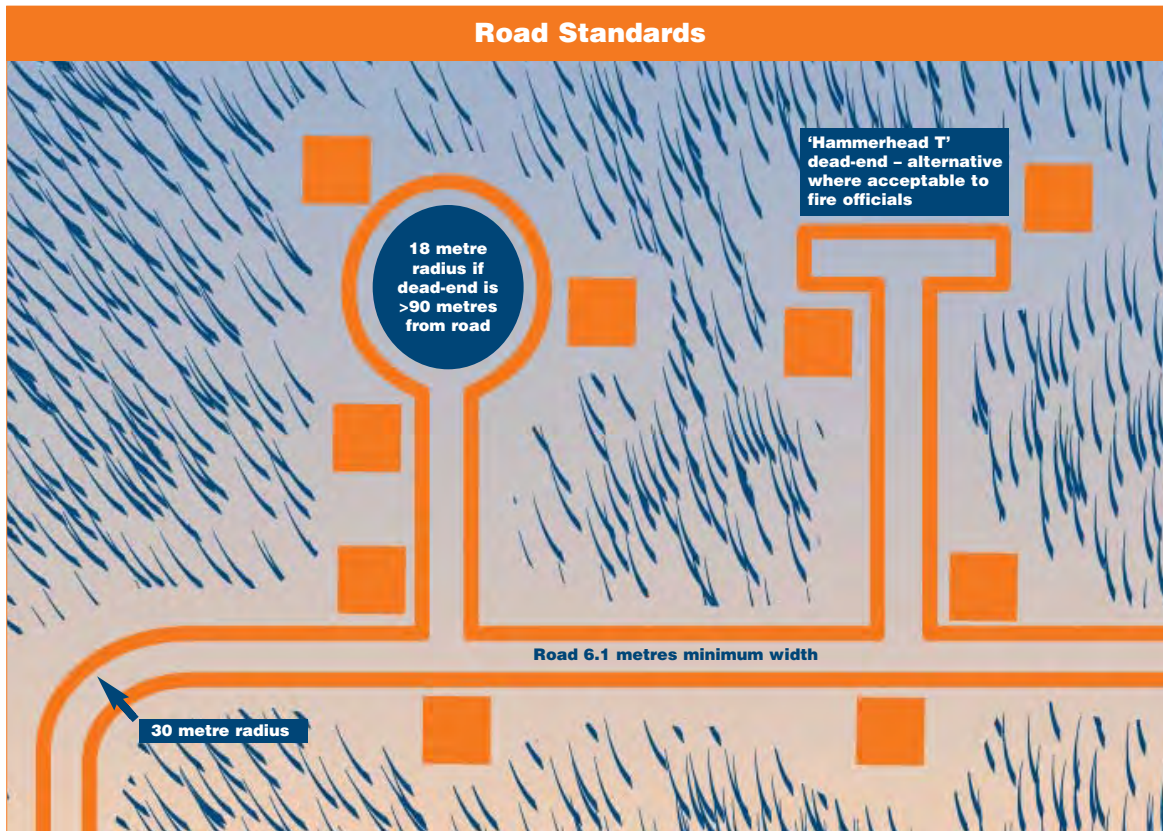
provided with turnouts at locations approved by fire officials.

- Driveway gradients should not exceed 10% Exceptions to this may be negotiated with fire officials.

- Driveway turns should not restrict the access of the largest emergency vehicle likely to be operated on the driveway. Fire officials will specify local emergency response agency requirements.

- All gates should be at least 9 metres from the public right-of-way and should not open outward. Gate openings should provide a clear opening at least .6 metres wider than the travelled way.

- Fire service personnel should be able to unlock any gate restricting fire service access.

- Driveways should have an all-weather surface capable of supporting any fire apparatus likely to be operated on the fire service access.

- Dead-end driveways more than 91 metres in length shall be provided with a turnaround at the terminus having no less than 15 metres outside diameter of traveled way. Fire officials



PHOTO: ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT

▶ *Visible signing is important.*

may authorize a "hammerhead T" turn-around to provide three point turnaround ability. Dead-end roads should have signs warning of their no-through-traffic status.

### Recommended guidelines for signs for road, driveways, and buildings

- Signs should be clearly visible and legible from the road and use a consistent system that provides for sequenced or patterned numbering and non-duplicated naming.
- Signs should be built of non-combustible materials and mounted 2 metres above the surface of the road.
- Signs with information such as "dead-end" or "bridge out" will be placed by designated by fire officials. Signs will be placed identifying firefighting water source and type of location.
- Letters, numbers, and symbols used on all signs should be at least 10 centimetres high with a 12-millimetre stroke, contrast with the background color of the sign, and be reflective.

## Open Spaces — Greenbelt Areas

Open space can be incorporated into interface areas whenever planning officials have an opportunity to dedicate tracts of land to non-residential purposes. The goal of providing or leaving natural open areas undeveloped is to incorporate the fuel modified area concept into the community layout.

Open-space or greenbelt areas are effective in moving the edge of the interface away from buildings, and in reducing the danger of wildfire spreading to buildings. Consider the topography and prevailing winds when planning the location of open spaces—place open spaces downslope or upwind of the community or facility. Open-space areas lose their effectiveness unless they are regularly maintained.

Some examples of open areas are parking lots, cultivated fields, orchards, golf courses, parks and playgrounds, or any area of sparsely forested land that has had surface and above-ground fuels removed.



PHOTO: BRIAN MOTTUS

### Recommended guidelines for open spaces — greenbelt areas

- Open spaces provide perimeter protection by moving the interface back from buildings and should be incorporated into interface developments and communities wherever possible.
- Where open spaces are used as firebreaks, they should be at least 30 metres wide on level ground and up to 50 metres wide when located on or near slopes. Fire officials may specify greater widths when higher hazard levels exist.
- Open spaces should have short grass or other closely trimmed vegetation. Remove surface and ladder fuels.
- Open-space perimeters should have fire service access routes that connect to principal roadways.

## Water Supply

Wildfire suppression needs substantial volumes of water from a dependable source. The capability of interface fire departments is limited by the adequacy of the water supply.

Some interface communities have a fire department and have a public water system with fire hydrants. Water main size, fire hydrant spacing and capabilities must comply with Fire Underwriters Survey or National Fire Protection Association standards. A public water system with fire hydrants or standpipes is a viable option where building density and community size allows for the added expense of establishing such a system.

◄ *An example of how open spaces can be incorporated into interface areas.*

30-metre minimum

Fire service access road 12-metre width minimum

Orchards

30-metre minimum

Subdivision

Parking lot

30-metre minimum

Golf course

Playground and School

Fire service access road 12-metre width minimum

30-metre minimum
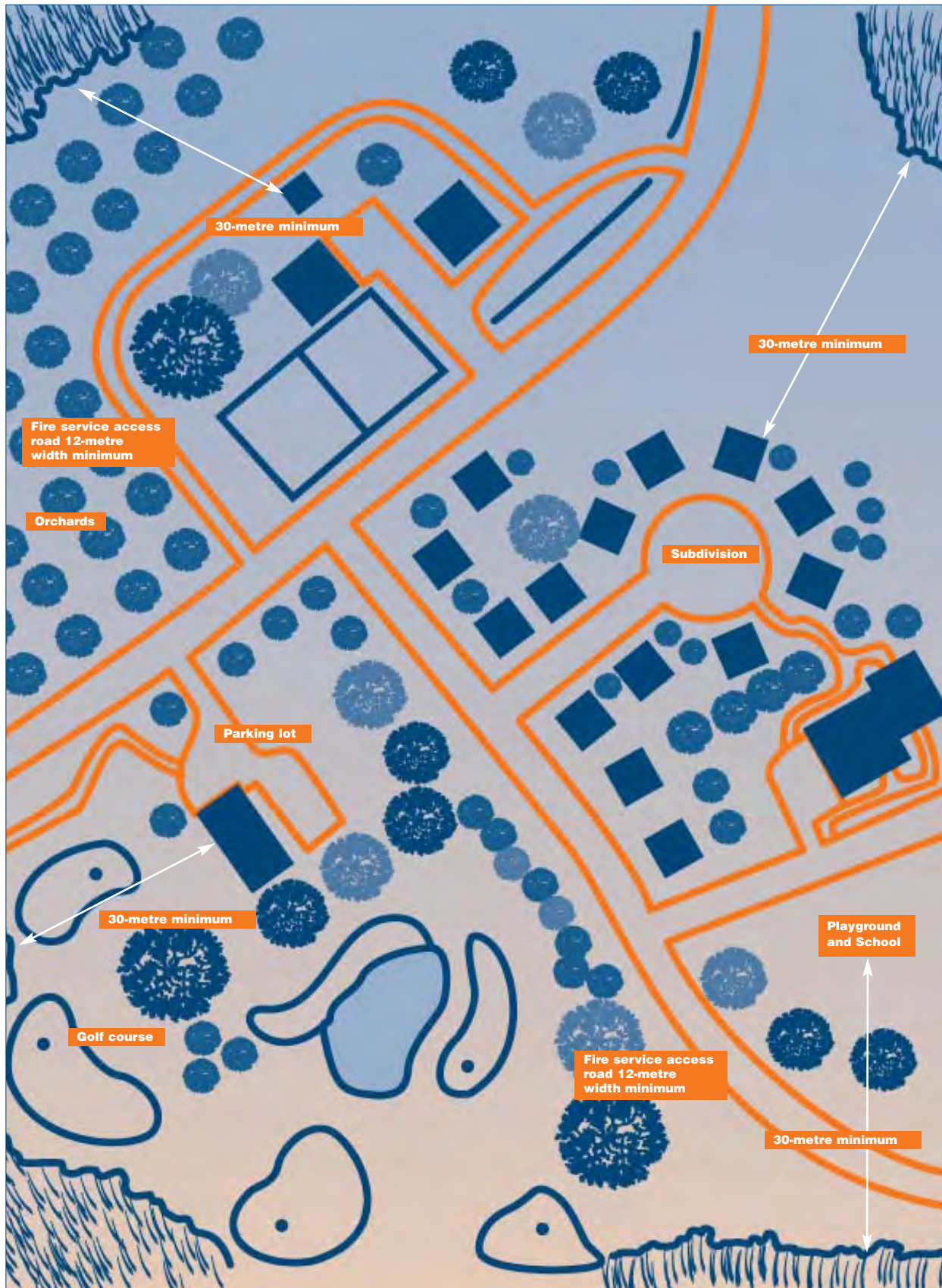
Some interface communities are served by a fire department but have no public water system. These communities begin with several residents sharing a single water source. Subsequent development increases structural density and property values, but water supplies do not expand along with the community.

Water supply for fire suppression in these communities is limited to the amount carried on fire trucks or developed on-site by the residents of the community. Community values and acceptance of risk should be considered, but fire officials should



► *Portable water reservoirs can supplement public supplies.*

PHOTO: NFPA

▼ *Portable floating pumps are effective on small water sources.*



PHOTO: INITIAL ATTACK

advise planners, developers or property owners that, without adequate water, fire protection capabilities will be limited.

Residents of communities without a fire department depend entirely on water sources they have developed to supply firefighting water delivery systems they have bought or built themselves.

The initial cost of an adequate public or private water system is high but will certainly be viewed as cost effective if there is ever an interface fire.

### Recommended guidelines for water supply

All buildings proposed and existing within interface areas should have a water supply for the purpose of firefighting, that meets the requirements of either the Fire Underwriters Survey Guide—Water Supply for Public Fire Protection, or the National Fire Protection Association (NFPA) 1231—Standard on Water Supplies for Suburban and Rural Fire Fighting.

### Fire protection water supply provided by homeowners

Interface homeowners with fire department protection and fire hydrants or standpipes already have a relatively high level of fire preparedness and may choose to implement only some of the measures. Interface homeowners with no fire department protection have a much lower level of fire preparedness and may choose to implement all of these measures.

Providing a firefighting pump and water delivery system that will meet the requirements of your property requires some planning. Fire officials and fire equipment retailers can advise interface homeowners or community groups on the most cost-effective methods of providing adequate water for fire protection. Be prepared to tell them:

1. the size of your buildings and their layout on the property;
2. the distance from the water source to buildings and other areas on your property requiring fire protection;
3. the vertical distance from the water source to the top of your building(s);
4. the approximate volume or flow rate of your water source.

### Domestic water supply

Structures in interface areas should use larger-diameter supply mains. This will provide higher volumes and pressures if household water supply has to be used for fire suppression.

There should be at least a 25-millimetre line between the community water main and any water outlet that might be used for firefighting. These outlets should have an operating pressure of at least 345 kPa (50 psi).

Hose connections should be plumbed on both the exterior of the building and on standpipes located 15 metres from the building. A 37-millimetre line equipped with forestry quick-couple connections provides a more effective supply. Garden hose outlets and connections are acceptable as a minimum.

### Hose

Keep enough garden hose at each interface building to allow a water stream to be directed on all exterior surfaces of the building, including the roof. Equip each hose with a nozzle and keep it connected during the fire season.

### Rooftop access ladder and sprinkler

Provide access to the roof in order to wet it down or suppress spot fires that may ignite on the roof. Connect the sprinkler to the hose and nail it to the roof, but turn it on only if fire is an immediate risk. Unnecessary use of water during interface fire incidents will reduce the firefighting water supply where it is needed most.

### Emergency water supply

Homeowners should consider a number of alternatives in installing water sources for fire suppression purposes.

### Independent water systems

Consider developing water supply systems that are not dependent on community water pressure or electric well pump (both of which are often unserviceable during interface fires). Reservoirs that gravity feed to a standpipe near the building with pressures between 345 and 690 kPa (50 and 100 psi) are excellent. Providing a 37-millimetre line equipped with forestry quick-couple hose connections will also greatly assist firefighters.



PHOTO: JOHN LUCKHURST

▲ *Ponds or dugouts can be a valuable source of water during interface suppression situations.*

### Electrically operated pumps

Most well water is supplied by electrical pumps. Consider having an auxiliary gasoline-powered generator that you can wire directly to your electrical pump. The alternative power source will ensure water supply if fire threatens your building or property. Residents with electrically supplied water pressure may wish to consider auxiliary gasoline-powered pumps for use during firefighting emergencies.



PHOTO: CDF

### Water storage capability

Tanks, ponds, pools, or underground cisterns can store water for emergency use. Storage vessels should have 37-millimetre hose connections and be located within 15 metres of the building. Make water available from private swimming pools and hot tubs accessible within 5 metres by fire department engines.

Interface buildings without a pressurized water system should have at least one large water barrel and a 10-litre fire pail.

PHOTO: CDF

### Gasoline-powered pumps

Consider a gasoline-powered pump if you are near a water source. You will need a gas-engine fire pump sufficient to supply your firefighting needs, and enough fire hose of adequate diameter (19mm, 25mm or 37mm) to reach all areas on your property that may require firefighting water.

### Sprinklers and Roof Watering Systems

Property owners with gasoline-powered pumps and independent water sources may wish to pre-configure a system of sprinklers or soaker hoses to further protect their properties. Sprinklers deliver a relatively low volume of water to a structure and surround-



PHOTO: ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT

ing vegetation over a period of time. In a matter of hours, structures and vegetation can be thoroughly soaked, increasing fire resistance significantly. A further advantage of sprinkler systems is that they can be configured to operate remotely, freeing firefighters and property owners to accomplish other tasks.

Sprinklers and roof watering systems should not be considered an alternative to the use of FireSmart construction materials and design standards or application of FireSmart vegetation management guidelines. Sprinkler systems do not provide reliable structure protection and can become unserviceable for a number of reasons. The soaking effect of sprinklers is quickly lost in high fire danger weather conditions or when equipment failures occur.

Research is currently underway to determine the most effective sprinkler head configurations and water flow rates for structure and property protection. Check for the latest results on the Partners in Protection website and consult your local fire officials for advice on sprinklers and roof watering system options.

### Firefighting Foams and Gels

Property owners with gasoline-powered pumps and independent water sources may wish to increase the effectiveness of their firefighting water supplies by considering the addition of approved firefighting foam concentrates, gels and wetting agents to the firefighting water supply.

Firefighting foam is a concentrated soap with a foaming additive that allows the water it is mixed with to expand, penetrate and extinguish fire more effectively than water alone. Firefighting foam concentrate is added to the firefighting water supply either at the pipe or at the specially designed foam nozzle.

Firefighting foams are relatively short-lived, especially under typical high-fire-danger weather conditions. Application of foam to structures and vegetation requiring protection from fire must occur almost immediately before the fire reaches the site.

Fire gels are a relatively new fire protection technology. **Not all gels are CSA approved - check before purchasing.** Fire gel concentrate is mixed with water, forming a tacky solution that is applied to any combustible structure or vegetation. The gel

PHOTO: RICK ARTHUR
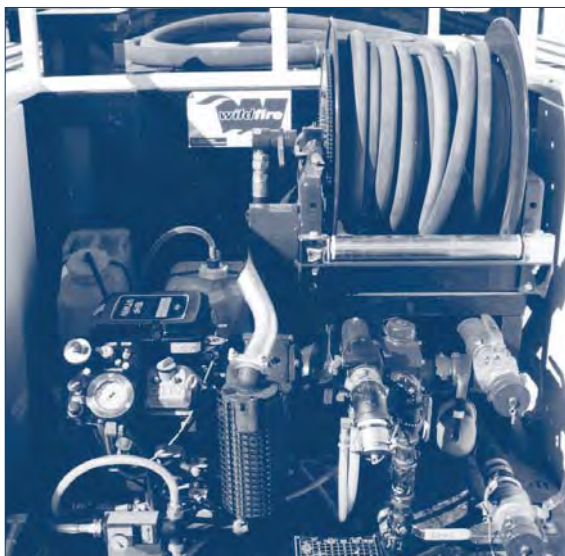
## Utilities — Electric and Gas

### Electric utilities

Overhead power lines have the potential to be a major source of ignition for interface fires. Primary distribution lines, normally below 25,000 volts, are a particular problem. They often run cross-country, making inspection and maintenance difficult. Downed conductors may remain energized. System circuit breakers may be re-energized several times, subsequent to an outage, before finally remaining open. Re-energizing of a conductor may cause arcing, which may in turn ignite combustible materials in the vicinity. Secondary services (lower voltage lines from the user's customer transformer to the premises) are lower in voltage. Although not as high a risk with respect to arcing, these lines are more susceptible to being overgrown with vegetation, causing short circuits, and possibly fires.



PHOTO: ATCO ELECTRIC

◄ *Adequate clearance is needed so that overhead power lines are not struck by falling trees.*
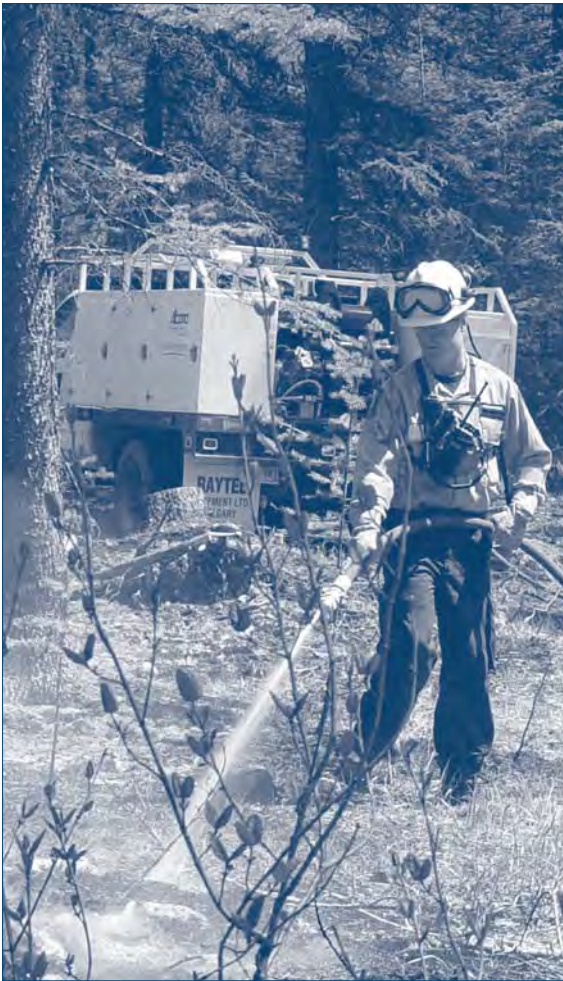
adheres well, even to vertical surfaces, and provides an insulating zone between the heat of the fire and the protected surface. Fire gels are mixed and applied in the same manner as firefighting foams using standard foam nozzles. Fire gel can also be applied using standard hoses and nozzles.

Fire gels are highly effective, providing a longer lasting fire retardant effect than firefighting foam. Gels can be rehydrated with more water if they dry out after application to protected surfaces. Fire gels can be difficult to clean off (pressure washing is required). Follow maintenance procedures to prevent the equipment becoming clogged.

Research on both foams and gels is ongoing. Check for the latest information on the Partners in Protection website. Consult local fire officials for further advice on the selection and use of firefighting foams and gels.

▶ *Secondary services are more susceptible to being overgrown with vegetation.*

PHOTO: ATCO ELECTRIC

*Recommended guidelines for electrical utilities.* Underground power distribution offers the greatest fire safety. These installations are not vulnerable to falling vegetation or traffic damage. Utilities, wire owners, or wire service providers should keep vegetation cleared to appropriate distances from the powerline to prevent vegetation from making contact. "Hazard trees"—trees likely to contact the powerline—should be removed. Vegetation under the powerlines may also contribute to ignitions. Contact your electrical utility company if this maintenance is necessary. They will gladly assist in carrying out the needed maintenance, or advise the property owner of what to do.

*Propane*

Propane tanks surrounded by dense concentrations of vegetation are potential bombs. When the wild-land fuels near the tanks burn during an interface fire, the internal pressure of the tank can cause the

## Tree Planting Near Rural Powerlines

**Acceptable Shrubs – examples:**

| | |
|---|---|
| Rose | Western Sandcherry |
| Lilac | Hawthorne |
| Honeysuckle | Currant |
| Black Cherry | Caragana |
| Redman Elder | |

5 metres

1.5 metres

Brush-free zone

8 metres
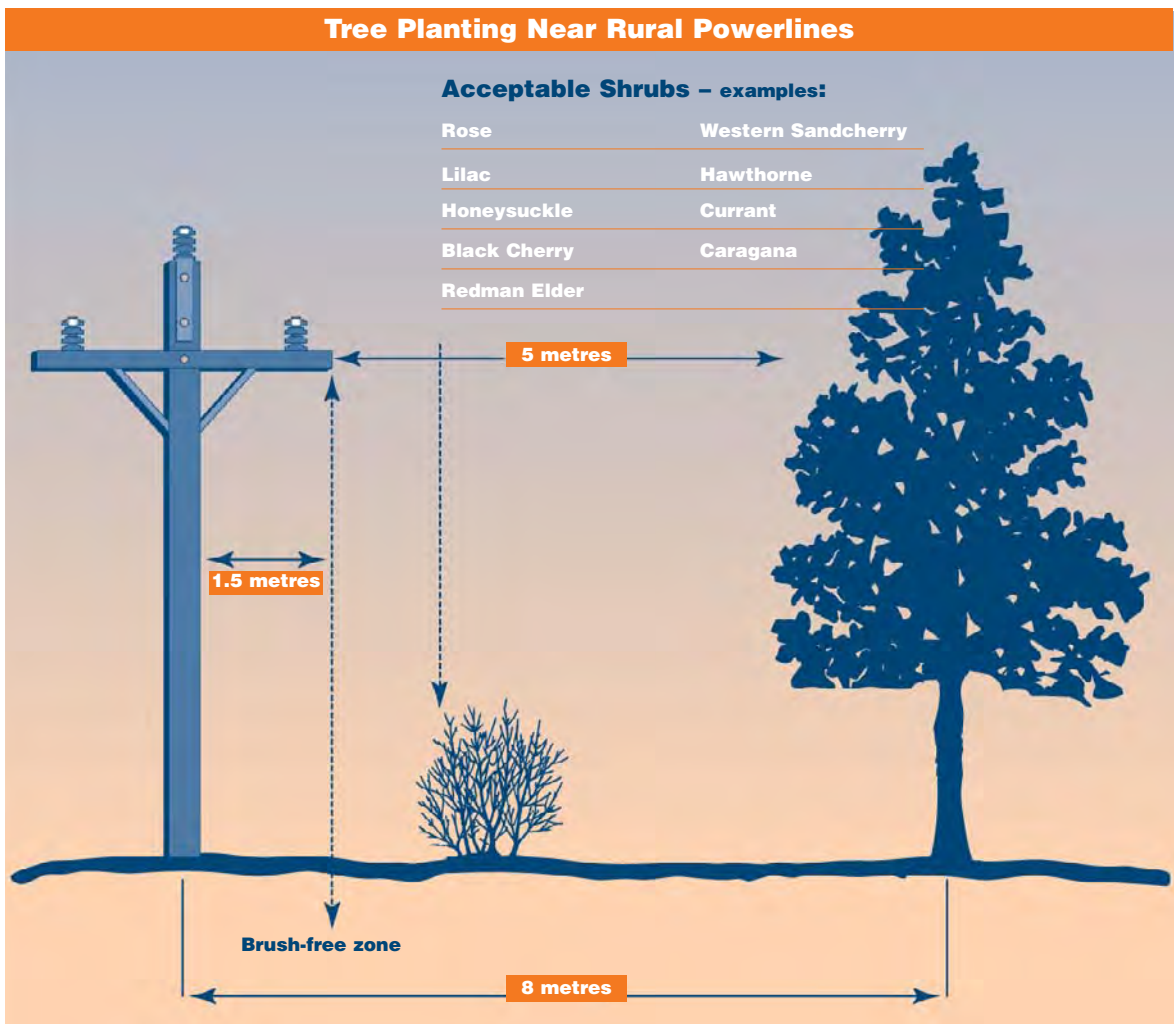
*◄ Properly located and maintained propane tanks.*

PHOTO: BRIAN MOTTUS

tank to vent through a relief valve. This will create an intense fire that could ignite nearby combustibles. If the venting tank is located immediately next to a building, loss of the building is almost guaranteed. For this reason, propane tank valves should point away from any building.

If the relief valve on the tank fails to function, a boiling liquid vapor explosion can result. These events are best described as catastrophic — a 2,300 litre (500 gallon) propane tank that explodes in this manner creates a shock wave that is capable of killing anyone within 300 metres. Propane tanks with untreated fuels next to them are a serious hazard to firefighters. Fire officials should note the locations of all tanks within interface areas and work with homeowners to ensure that propane tanks are safely maintained.

### Recommended guidelines for propane
Propane tanks should have all vegetation within 3 metres cleared away. Locate tanks at least 10 metres from the building.

### Summary
Chapter 3 provides manual users with a number of recommended guidelines for the design, layout, construction, and maintenance of interface buildings and communities. These guidelines are based primarily on National Fire Protection Association (NFPA) standards that are published as a code NFPA 1144 – Standard for Protection of Life and Property from Wildfire.

A variety of other codes and standards are cited with pertinent and applicable items included in Chapter 3 as components of the recommended guidelines or general discussion.

An important adjunct to Chapter 3 is provided in Appendix 2. These recommended guidelines are based on standards developed by Arbor (1991). All fuel management activities that could be prescribed for interface fire danger mitigation are covered in detail within these recommended guidelines.

# Emergency Measures

CHAPTER FOUR *provides an overview of agency emergency response protocols, specifically Incident Command and Emergency Site Management systems, and an outline of municipal emergency structures and plans that have interface fire components. We include a discussion of interface fire characteristics and response strategies. Part of this chapter covers what interface residents need to know about what to do before and during an interface fire emergency.*

## INTERFACE FIRE CHARACTERISTICS AND RESPONSE STRATEGY

### Interface Fire — Disaster or Fire Event?

Wildland fires are as much a part of the forest as trees and animals are. Fires burning in and around buildings or communities in the forest will have some effect on those communities.

Whether the effect turns out to be a disaster or simply a fire event depends on how well prepared interface residents are. Communities or buildings are FireSmart when they are designed, built, and maintained to minimize the effects of wildland fire burning in adjacent forest or brush. Residents of FireSmart interface areas may be inconvenienced by

▶ *Whether a wildfire turns out to be a disaster or simply a fire event depends on how well prepared interface residents are.*

PHOTO: COLORADO STATE FOREST SERVICE

CHAPTER PAGE PHOTOS: KENJI LUSTER AND RICHARD SIEMENS (FLAMES)

smoke, ash, and access restrictions during seasonal fire events but disaster will be rare.

The increasing incidence of interface fire has forced both wildland and structural firefighters to adapt their standard operating procedures to the new challenges. The remainder of this chapter focuses on that issue.

## Interface Fire Characteristics and Suppression Response Challenges

Major wildland/urban interface fires have characteristics that challenge the effectiveness of emergency response efforts and contribute substantively to their costly and tragic impacts.

### Limitations on response to structural and wildland fire

Interface fire typically involves both wildland and structural fires. There are some significant differences between wildland and structural fire suppression tactics.

**Wildland firefighters** have traditionally suppressed wildland fires by establishing a defensible firebreak at some advantageous location in front of an advancing fire. The firebreak deprives the fire of fuel



PHOTO: PARKS CANADA

and the fire is extinguished (unless the fire "spots" or radiates across the firebreak). This tactic owes much of its success to the fact that firefighters locate fuelbreaks in lighter fuels or at terrain breaks—areas where firefighters have the best chance of holding the fire. In addition, controlled fire tactics (burning off fuels adjacent to, and on the fire side of, the control line) are used to increase the effective width of control lines.

Wildland firefighters are challenged by the numbers and locations of homes in the interface, reducing the effectiveness of the control-line method of fire suppression. Use of controlled fire to increase control-line effectiveness is difficult as homes and people are often located on both sides of a possible control-line location. Use of air tankers, a highly effective suppression resource, must be carefully planned to avoid concerns for resident safety.
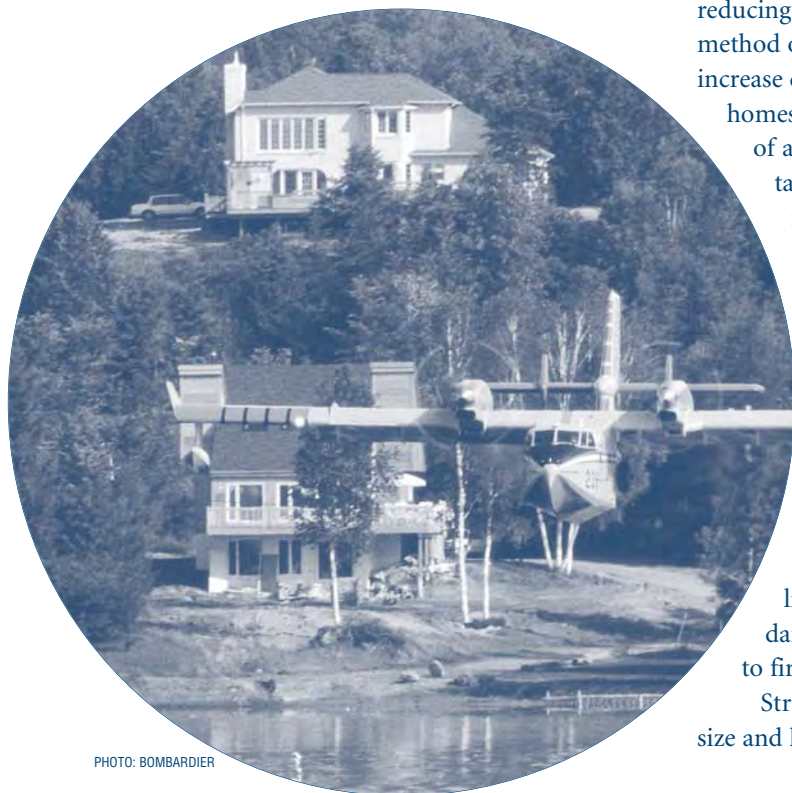
**Structural firefighters** have traditionally suppressed structural fires by cooling them with water. Rapid response times and the availability of relatively large volumes of water (hydrant-supplied) ensured effective suppression of typical urban structural fires. Both wildland and structural firefighters recognize various limitations in the application of their standard operating procedures when responding to fires in the interface.

Structural firefighters are challenged by the size and heat output of the wildland fire fronts that

▲ *Wildland firefighters have traditionally suppressed wildland fires by establishing a defensible firebreak at some advantageous location in front of an advancing fire.*

◄ *Canadair 415 working to protect an interface community.*



PHOTO: BOMBARDIER

PHOTO: PARKS CANADA

are part of interface fire. The water application techniques used to suppress building fires are not effective for the suppression of wildland fires. They need new equipment and training in wildland tactics.
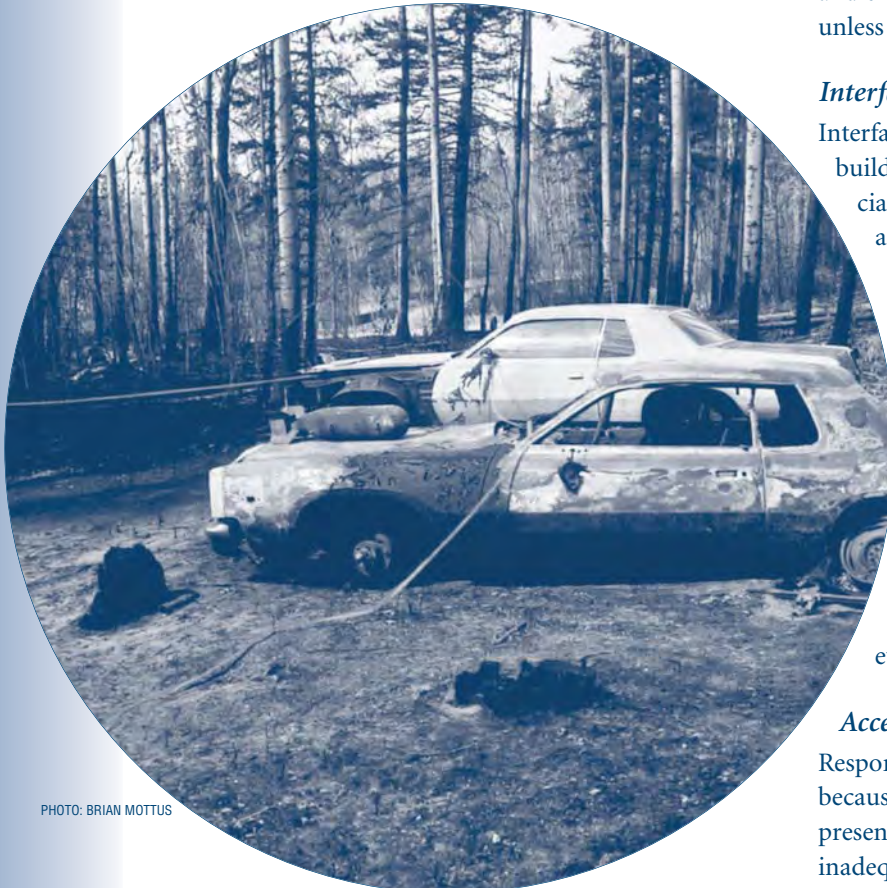


PHOTO: BRIAN MOTTUS

Specific problems challenging fire suppression professionals include:

### Firefighter safety

Interface fires occur relatively infrequently. Most emergency responders will be working outside their normal operational parameters. Most interface fire events are short-duration, but highly destructive and chaotic events.

Interface emergency responders must have a high level of preparedness, which includes training and drills. Without this training, their effective response capability will be significantly reduced.

Wildland firefighters face a variety of structural fire dangers and challenges in the wildland/urban interface and need new operational procedures and training. Power lines, pressurized gas containers, hazardous materials, vehicle fires, and the intensity of the structural fires themselves all present challenges.

Structural firefighters may be unaccustomed to wildland fire behavior. The dynamic, fast-spreading character of a wildland fire can compromise the safe and effective deployment of suppression resources unless tactics are adapted and training provided.

### Interface fire behavior

Interface fires often occur as multiple fire starts on buildings and in wildland fuels. High winds (associated with almost every interface fire disaster) and steep slopes (a physical component of many interface communities) accelerate the initial fire spread. In most cases, local resources are rapidly overwhelmed as fires ignite in many areas simultaneously and spread quickly.

### Resident safety

Both structural and wildland firefighters responding to interface fires are often distracted from their principal fire suppression mission by the needs of evacuating residents.

### Access problems

Response times are longer in the interface, often because of remote locations and access difficulties presented by narrow, steep and winding roads with inadequate bridges and signing. Roads may be too

PHOTO: NFPA

narrow to allow evacuation of residents and access by firefighters at the same time. Larger fire engines will not be able to negotiate narrow and overgrown driveways. Smoke and ash carried by high winds severely reduce visibility, limiting the ability of firefighters to detect and get to fire sites.

### Inadequate water supply

Many interface communities do not have water systems capable of providing the large volumes of water typically used for structural firefighting. Interface fire frequently damages power lines and puts electrically driven water systems out of service.

### Structure triage

Firefighters must assess and assign priority to buildings requiring protection from wildfire. Structure triage requires firefighters to quickly categorize threatened buildings as needing little or no immediate attention; needing protection but likely to survive; or hopeless.

The goal of structure triage is to provide fire suppression resources that have the greatest opportunity for successful deployment, while minimizing ineffective deployments that waste time and resources.

This type of decision-making process is often hard for firefighters unaccustomed to turning down suppression assignments, thus acknowledging failure.

### Multi-agency response

Interface fires frequently involve multi-jurisdictional and therefore multi-agency responses. Equipment and communication network incompatibilities may create problems. Having common procedures—such as the Incident Command System (ICS)—for controlling personnel, facilities, equipment, and communications results in a more efficient and effective response. But agencies using ICS must adapt their operational procedures and train and drill with other agencies.

▲ *Common procedures, such as ICS, help people from different jurisdictions and agencies to work together.*

# INCIDENT COMMAND SYSTEM (ICS)

▶ *ICS allows different agencies to work together effectively and efficiently.*



PHOTO: PARKS CANADA

Canadian emergency response agencies use a variety of emergency management systems. Common emergency management systems likely to be used during a major interface fire emergency response are Incident Command System (ICS), Emergency Site Management (ESM), and Fire Ground Command (FGC). Many jurisdictions across Canada are now switching to ICS.

## Incident Command System — Brief Outline

### History of ICS

ICS developed as a consequence of the fires that consumed large portions of Southern California in 1970. The ICS is an emergency response management system commonly used by fire departments, particularly when more than one type of emergency response discipline is present at an incident. ICS is also widely used by industry and transportation agencies throughout much of North America. ICS will be the emergency management system for all provincial and federal wildfire agencies by 2004.

### What is ICS?

ICS allows different agencies to work together effectively and efficiently toward a common goal. The system consists of procedures for managing and controlling personnel, facilities, equipment, and communications.

ICS is a standardized on scene emergency management system. ICS is specifically designed to allow users to adopt and integrate an organization structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS begins developing from the start of an incident and continues until the need for operations management ends. This usually comprises the five major management activities of command, operations, planning, logistics, and finance/administration. The five major management activities are the foundation on which the ICS organization develops as needed. Structure can be established or expanded depending on the changing conditions of the incident.

A principal benefit of ICS is that it can expand or contract quickly as the situation develops. ICS can be used for any type or size of emergency ranging from a minor incident involving only a

few responding units to a major incident involving several agencies.

In small incidents, one person, called the "Incident Commander" or simply the "IC," may manage all five activities. In large incidents, the major activities usually need to be set up as separate sections within the organization. Not all sections will be needed for all incidents. The Incident Commander will decide which sections to activate, based on the details of the incident. Each of the primary ICS sections may be further subdivided as needed. The only activity that must be established at each operation is Command.

The Incident Commander can be any qualified individual (e.g., Fire Service Fire Chief or Forest Service IC). ICS can be staffed and operated by qualified personnel from any agency and may involve personnel from a variety of agencies. The basic operating guideline in ICS is that the person at the top of the organization is responsible for managing all functions until the authority is delegated to another person. This is applicable to all levels of the organization.

If an incident develops into a larger event, the original Incident Commander may become responsible for only one activity (e.g., Operations) while another individual (e.g., more senior or from another discipline) would then become Incident Commander. Similarly, as an incident is reduced, the command function could be delegated down as the resources on the site are reduced.

It is critical to ICS that the Incident Commander is clearly identified and given the authority to allow effective command and control of all resources and activities. It is also critical in ensuring the success of a large multi-agency response that all responders are familiar with the ICS concept and structure, and can work within a changing command relationship.

## Incident Command System — Components

Where an agency has jurisdiction over multiple-agency incidents, it should organize the field response using ICS to provide for coordinated



*It is critical to ICS that the Incident Commander is clearly identified and given the authority to allow effective management of all resources and activities.*

PHOTO: PARKS CANADA

decision-making with emergency response agencies.

The Incident Command System has a number of principles and features. It is these features working together that make ICS a real management system. Some of the key features are:

**Common terminology**

Using the same terms for organizational function, resources, and facilities makes for effective communication within ICS.

**Modular organization**

The ICS organizational structure is based on the kind and size of an incident. The organization's staff builds from the top down, with responsibility for performance placed initially with the Incident Commander. As the need exists, the staff organize operations, planning, logistics, and finance as separate sections, each with several units, branches, or divisions.

**Integrated communications**

Communications are managed with a common communications plan and a communications centre established for the use of tactical and support resources assigned to the incident.

**Unified command structure**

ICS's command structure allows all agencies with responsibility for the incident, either geographic or functional, to manage an incident by establishing a common set of incident objectives and strategies. This is accomplished without losing or giving up agency authority, autonomy, responsibility, accountability, or varying from standard operational procedures.

**Consolidated action plans**

The Incident Commander identifies objectives and makes strategy decisions for the incident based on the requirements of the jurisdiction. In the case of a unified command, the incident objectives must adequately reflect the policy and needs of all the jurisdictional agencies. The action plan for the incident identifies tactical options and support activities needed for the operational period.

**Manageable span-of-control**

This is a limitation on the number of emergency response personnel (usually between three and seven) within ICS that an individual supervisor can effectively and safely supervise or direct. The kind of incident, the nature of the response or task, distance, and safety will all influence the span-of-control range.

**Incident facilities**

The ICS identifies facilities that can be designated as incident facilities for the duration of the event. The types and locations of facilities will be based on the requirements of the incident.

**Comprehensive resource management**

The identification, grouping, assignment, and tracking of resources is essential to the success of ICS.

## Emergency Site Management — Brief Outline

### What is ESM?

The Emergency Site Management (ESM) system is practised by local authorities as a concept and structure for coordinating all resources within a municipality to respond to an emergency or disaster. These might include social services, health authority/health-care facilities, school boards, public works, utilities, non-government organizations, private sector resources, provincial and federal department representatives, and mutual aid resources from adjoining municipalities, as well as front-line emergency responders.

ESM has a less rigidly structured command concept than the ICS system. It developed as a more collegial, less paramilitary approach, to the emergency response management challenges faced by municipal responders. ESM is not practiced in B.C. where ICS is the provincially mandated emergency management system.

The ESM system recognizes that many municipal emergencies involve a wide range of organizations and need timely information as well as an efficient multi-agency decision-making process. It emphasizes the appointment of one overall emergency site manager to coordinate the response by all agencies on site in a collective, consultative fashion. The emergency site manager serves as an information transfer link with off-site operations centres (municipal and provincial) established to support the site.

The ESM concept allows local authorities to

◀ *At the Emergency Operations Centre, agencies work together and maintain contact with the emergency site.*

work on all aspects of an emergency or disaster, beyond the direct concerns of the emergency response itself. This includes ongoing municipal infrastructure functions, hazard identification and evacuation efforts, as well as the longer-term issues of recovery after the emergency or disaster is over.

### *Emergency Site Management — System Structure*

**Municipal Emergency Coordinator— pre-incident responsibilities**

- Develops a Municipal Emergency Plan.
- Communicates with other response agencies, mutual aid partners and volunteer groups.
- Maintains a Municipal Emergency Plan manual with updated contact lists.
- Oversees the municipality's emergency preparedness program.

**Municipal Emergency Coordinator— incident responsibilities**

- Maintains contact with emergency site during the incident.
- Directs the emergency operation centre as a decision-maker and facilitator.
- Ensures requested resources are provided

to the emergency site.
- Keeps elected officials informed of incident progression.
- Coordinates resource allocation to municipal issues/incidents outside the perimeter of the emergency site.

### *Emergency Operations Centre (EOC)*

At the Emergency Operations Centre, responding and supporting agencies gather and maintain contact with the emergency site. Ideally, every responding agency at the emergency site will have a corresponding agency representative at the center, and each rep will obtain as much information as possible from their site rep.

**EOC Agency Representative— incident responsibilities**

- Determines the nature and scope of the incident.
- Ensures that mandated agency responsibilities are fulfilled.
- Ensures that agency resources are available to, or in place at, the emergency site.
- Ensures that a safe and effective response is occurring.
- Establishes a communication link with the

corresponding agency representative at the emergency site to ensure that information is flowing between the EOC and the emergency site.

- Contacts mutual aid partners with incident status and estimated resource needs.

**Emergency Site Commander— incident responsibilities**

- May activate the emergency public warning system.
- Secures the site: establishes perimeters and moves responders and the affected public to safe positions.
- Ensures a communications link is established with the Emergency Operations Centre.
- Requests resources from the centre as needed.
- Co-ordinates all response at the site, makes decisions, establishes mutual priorities and allocates resources.
- Communicates with all responding agencies and disseminates information.
- Monitors the process to ensure that all responders are informed (updated or adequately briefed on arrival).
- Monitors the process to ensure that resources are used appropriately.

### Provincial Government Emergency Operations Centre

In many large and particularly complex situations, especially if they involve several municipalities over an extended time, municipal emergency operations staff will work with the Provincial Regional Emergency Operations Centre and Provincial Emergency Coordination Centre. This is especially useful when smaller communities with limited resources are overwhelmed by an incident.

**The Emergency Operations Centre**

- Co-ordinates the provincial government response and municipal support to local governments.
- Provides specialized leasing, purchasing, or borrowing of emergency products or services.
- Provides timely distribution of reliable information (to reduce misinformation and rumors).

- Assists with requests for supporting materials and supplies beyond the capacity of the municipality.
- Operations centre representatives remain in constant contact with the affected municipality through the provincial emergency management organization liaison officer who is normally located at the municipal EOC centre.

**Government emergency management organization liaison**

- Establishes communications between government and municipal/local authority emergency management organizations. A representative may be sent to the local government to act in a liaison capacity or provide additional assistance as required.
- Shadows municipal/local authority EOC activities to provide an external perspective as the incident progresses.
- Assesses evolving resource requirements that may involve provincial (or federal) resources (anticipates lead-time for resource activation, and helps with efficient deployment).

### Other involved agencies and groups

A number of agencies have mandated responsibilities that may involve them directly or indirectly in an emergency response to an interface fire. A brief summary of the agencies' responsibilities:

**Wildland fire services**

- Protect forest and range resources on public lands within their jurisdiction. Their primary role is wildfire suppression. Most wildland fire fighters have little or no training in fighting structural fires.

**Fire Commissioner's office**

- Provides authority for evacuation initiatives in some provinces.

**Fire departments**

- Protect lives and property within the departmental jurisdiction.
- Their primary role is structural fire suppression, although in many jurisdictions they are responsible for wildfires as well.

**Utilities and Public Works**
- Assist response effort at the incident with technical support.
- Assess and reestablish damaged infrastructure (according to priority).

**Transportation authority**
- Secures any transportation corridors affected by the incident.
- Manages traffic.
- Establishes and controls detours.
- Maintains, repairs, and expedites reopening of transportation infrastructure.

**Police**
- Protect life and property, establish and maintain a secure incident perimeter
- Safeguard evidence, conduct investigations.
- Control traffic and crowds.
- Coordinate emergency evacuations and enforcement of evacuation orders.

**Social Services**
- Activates reception centre.
- Provides food, shelter, clothing, and personal services for evacuees.
- Tracks evacuees (registration and inquiry).

**Environment**
- Monitors environmental impacts associated with incident.
- Works with responders to ensure that safe and effective incident response has minimal adverse environmental impacts.

**Health**
- Addresses incident-specific health concerns of affected public or responders.
- Communicates with social services to attend to health care concerns of evacuees.

**Agriculture**
- Assesses and mitigates the impact of the fire on agricultural resources.
- Assists with evacuation and care of livestock (or slaughter and disposal of injured livestock).

**Public Information Officer**
- Ensures that all information released has been approved by the municipal emergency coordinator.
- Maintains contact with all emergency operations centre representatives.
- Ensures that all inquiries are responded to accurately and promptly.

**Media**
- Report the news.
- Assist prevention and preparedness efforts with public service bulletins and announcements.
- Assist response and recovery efforts by informing the public of incident status, current risk, and protective measures.

**Local volunteer organizations**
- Whether pre-organized or spontaneously assembled, local volunteers can be of great help in response and recovery efforts. Interface fire incidents will also benefit from a formal approach to organizing and using volunteers.

**Elected representatives (mayor or designate)**
- Ensure that the municipal body is prepared for emergency (pre-incident).
- Provide overall leadership and continuity of government.
- Declare a state of local emergency.
- Communicate incident status (through news conferences and official statements).
- During the incident, their primary concern is public safety and protection of property.



PHOTO: LARRY MAYER

# Municipal Emergency Structures

## Municipal Emergency Structures across Canada

Municipalities are responsible for providing the initial response to most emergencies occurring within their municipal boundaries. This response will occur in accordance with an established Municipal Emergency Plan, as required by provincial or territorial legislation. Municipal emergency structures carry different names in different provinces, but are built on similar concepts and principles. It is important that emergency response groups or organizations functioning in interface fire-prone areas understand all the components of a municipal emergency structure.

## Municipal Emergency Structure — the Alberta Example

The province of Alberta uses a typical municipal emergency structure that is reviewed here as an example. Alberta's Disaster Services Act requires municipalities (which include cities, towns, villages, counties, municipal districts, national parks and Indian reserves, approximately 400 in all) to develop a Municipal Emergency Plan. They must create the following authorities:

## Canadian Emergency Management Legislation

| Province or Territory | Legislation | Name of Municipal or Community Level Plan | Title of Responsible Official |
|---|---|---|---|
| FIRST NATIONS | Emergency Program Act | Local Emergency Plan | Emergency Coordinator |
| BC | Emergency Program Act | Local Authority Emergency Plan | Local Authority Emergency Program Coordinator |
| AB | Disaster Services Act | Municipal Emergency Plan | Director of Disaster Services |
| SK | Emergency Planning Act | Municipal Emergency Plan | Local Authority Emergency Measures Organization Coordinator |
| YK | Emergency Measures Act | Municipal Emergency Plan | Municipal Emergency Coordinator |
| NWT | Emergency Measures Act | Emergency Response Plan | Senior Administrative Officer |
| MAN | Emergency Measures Act | Emergency Preparedness Plan | Emergency Coordinator |
| ONT | Emergency Management Act | Emergency Plan | Emergency Measures Coordinator |
| PQ | Municipal Act | Emergency Plan | Emergency Director |
| NB | Emergency Measures Act | Emergency Measures Organization | Emergency Coordinator |
| NS | Emergency Measures Act | Emergency Measures Organization | Emergency Measures Coordinator |
| PEI | Emergency Act | Emergency Plan | Emergency Coordinator |
| NFLD | Municipalities Act | Municipal Emergency Plan | Town Manager |

## MUNICIPAL EMERGENCY PLAN

Emergency Management Alberta (the provincial emergency measures organization) provides a model municipal emergency plan on computer disk so that local officials can simply fill in municipality-specific details. Municipal bylaws further define the agency, committee and director while providing operating authority.

**State of Local Emergency and Liability**
Bylaws establishing a local emergency organization usually include the provision to declare a State of Local Emergency which provides extraordinary powers to local officials. These can include conscripting persons and equipment, ordering evacuations, declaring restricted areas, and ordering hazardous buildings destroyed. In general, it allows any initiatives that assist emergency response and enhance public safety.

B.C. and Alberta Legislation also indemnifies municipal officials. Unless they are grossly negligent, emergency responders and administrators are protected under provincial legislation.

**Disaster Services Committee — official role**
• Oversees disaster planning, response and recovery.
• Is comprised of elected officials of the municipal council.
• Is often a municipal council or designated members of a council.

**Disaster Services Agency — functional role**
• Performs planning and actual disaster response.
• Includes representatives from all agencies involved in response or support capacities.

**Director of Disaster Services — command function**
• Directs the Disaster Services Agency in preparedness and response activities.

• Is often the municipal administrator, fire chief or other key municipal position.

### Municipal Emergency Structure — the British Columbia Example

British Columbia's *Emergency Program Act* requires all incorporated municipalities (i.e. cities, towns, villages) and allows for regional districts that have passed emergency measures by-laws to establish and maintain an emergency management organization.

Each organization develops and implements emergency plans and other preparedness, response and recovery measures. The local emergency program must create the following authorities:

**Emergency Program Executive Committee**
The organization authorized by the Mayor/Chair /Chief and Council to guide the Emergency Program for the community. The Executive Committee normally consists of the Mayor/Chair /Chief, a Councilor and the Principal Appointed Officer. The Executive Committee approves budgets, recommends policies, and ensures full implementation of a bylaw establishing the program and a bylaw detailing the operations.

**Emergency Program Management Committee**
The Executive Committee establishes and delegates certain powers to the Emergency Program Management Committee. The Management Committee manages the program on a daily basis and forms the EOC in time of emergency.



PHOTO: NFPA

**Emergency Program Coordinator**

The Emergency Program Coordinator has the responsibility for acting on behalf of the Executive Committee in managing the day-to-day business of the organization.

## Municipal Emergency Plan — Interface Fire Components

Municipal emergency plans should include the following components specific to interface fire:

### Interface fire hazard assessment

One of the first steps in ensuring that interface fire emergency concerns are adequately addressed by a Municipal Emergency Plan is to quantify and map the interface fire hazard within the area and adjacent municipal boundaries. (Hazard assessment forms and guidelines for their use are provided in Chapter 2).

Completion of the hazard assessment process will provide emergency officials with a clear picture of the level of hazard faced by their community and where that hazard exists - key factors in targeting interface fire prevention and mitigation programs. The hazard assessment data may also be used for risk assessment purposes.

### Interface fire planning

Planning for interface fire emergencies will require that officials look at the categories of emergency preparedness, response, and recovery. Consider the following:

### Interface fire preparedness and weather

Interface fire emergency plans must recognize that interface fire hazard varies with weather conditions. Wildland fire protection agencies have developed various red-flag programs that link high-fire-danger weather forecasts to operational preparedness and tactical considerations. Municipal emergency plans should incorporate flexibility to allow for weather-dependent hazards.

### Interface fire suppression training

There are significant differences between fire suppression tactics for wildland and structural fires. Training and cross-training initiatives are designed



PHOTO: RICK ARTHUR

PHOTO: BOMBARDIER

◄ *Mutual aid agreements at the national level facilitate sharing of specialized personnel, equipment and aircraft such as Canadair 415 water bombers.*

to assist firefighters from both wildland and structural agencies to overcome limitations in existing standard operating procedures and to streamline joint response efforts. (See Chapter 5 for a recommended approach to this training.)

### Mutual aid agreements

Interface fire emergencies often exceed local emergency response capabilities soon after they begin. Municipal emergency plans should address mutual aid agreements and memorandums of understanding to ensure that additional sources of personnel and equipment are identified and available. Mutual aid agreements at the national level facilitate sharing of specialized personnel, equipment and aircraft such as Canadair 415 water bombers.

A mutual aid agreement for interface fire should contain resource inventories that give status (available or out of service) and source (local or by request from neighboring communities or industrial facilities if not already deployed there).

Officials should recognize that interface fire emergencies may occur in many adjoining communities simultaneously and that this will reduce the availability of mutual aid resources.

Mutual aid agreements formally specify mutual assistance arrangements with neighboring municipalities and possibly industry. Provincial emergency officials may be able to provide model agreements to simplify the process. Mutual aid agreements should be reviewed annually to give fire protection officials opportunity to discuss and record:

- Responsibility and jurisdiction
- Additions and deletions from equipment inventories
- Resource-sharing options
- Equipment and communications compatibility
- Cross-training or fire-simulation exercises
- Mutual operations in emergencies.
- Emergency contact information

## Emergency Response Procedure for Interface Fire

Fire officials must also plan for the possibility of partial or total failure of any interface fire response. They should consider their:

- Emergency warning system
- Evacuation routes
- Marshalling points and reception centres
- Evacuation procedures
- Evacuation process (the example used here is from British Columbia)

Three-stage evacuation process
- Conducting the evacuation—three-step process
- Evacuation plan outline
- Evacuation procedures

### Emergency warning system

Many municipalities have an emergency public warning system that uses radio and television broadcasts to alert residents of ongoing disasters. While broadcast-based warning systems are effective for many types of disasters, the fast-spreading nature of interface fires means that interface fire disaster warning systems must be more site-specific and quickly activated. Interface communities should establish a disaster warning system at the local or neighborhood level. Use the warning system only for:

- Wildland fire threatening homes or lives
- A house or building fire
- Life-threatening injury or situation

A signalling device will summon assistance from neighbors and the surrounding community. In an interface fire, action by enough residents summoned in time can make the difference between a fire that escapes and one that is controlled quickly.

For the warning system to be effective, all residents must recognize the importance of the signal and ensure that the system is used only for serious emergencies. All residents must have access to a signalling device and understand how to use it. Residents must select a signalling device.

A number of options exist, ranging from ringing bells to whistles or automobile horns. A centrally located signal will be heard throughout the neighborhood or small community and can be very effective. A large bell with a rope needs no electricity, little maintenance, and is relatively inexpensive.

One disadvantage of the centrally located system is that it may be prone to vandalism and abuse. Consider a break-glass-to-operate security system. Other problems with a centrally located system result from the fact that it cannot be located near every resident, so that someone will be needed to

▶ *Principal evacuation routes should lead away from the advancing wildfire to a safety zone.*

PHOTO: KELVIN HIRSCH

leave the scene of the emergency to sound the alarm.

Whistles, bells, or automobile horns are good choices. They help responders by being location-specific. If an automobile horn is the signal, it must be used in a distinctive pattern (such as three, five-second blasts, for example).

### Evacuation routes

Interface communities should have a pre-designated principal evacuation route. Principal evacuation routes should:

- Lead away from the advancing wildfire to a safety zone.
- Be designed with consideration of prevailing winds and avoid areas of dense forest fuels along the route.
- Be wide enough for two-way traffic (consider incoming fire emergency vehicles).
- Be well marked with standard signage. Road surface and grade should be suitable for two-wheel-drive cars.

In most interface developments, the principal access route will also serve as the principal evacuation route. All access routes should be built and maintained to a standard that will allow them to be safely used for an evacuation.

Secondary evacuation routes are also important to the safety of interface residents. They may be the only routes to safety in the event that the principal evacuation route is blocked by fire, vehicle accidents, or by emergency vehicles. The secondary evacuation route should be known and accessible to all area residents. Looped road networks will often provide secondary evacuation routes. Where a secondary evacuation route could be inadvertently blocked by parked vehicles, the route should be clearly signed.

> **FIRE ROUTE—DO NOT BLOCK**

### Marshalling points and reception centres

A marshalling point is a safety zone where evacuated persons can assemble. Fire officials can then ensure that all members of the evacuated community are safely accounted for. Evacuation officials can start working with evacuated persons to arrange for food, clothing, shelter, medical assistance, and transportation to reception centres or other designated areas. Large, open fields located along main roads are

PHOTO: RICK ARTHUR

often the best marshalling points. A marshalling point should be:

- A safety zone (removed from any hazard of wildfire, heavy smoke, or other hazards.)
- Large enough to accommodate the entire community.
- Accessible by primary and secondary evacuation routes.
- Pre-designated and known to all members of the interface community.

Reception centres are different from marshalling points. Many different marshalling areas may direct evacuees to a central reception centre. Reception centres attend to the immediate needs of evacuees

▲ *A marshalling point is a safety zone where evacuated persons can assemble.*

▶ *Providing complete and up-to-date information is critical to an efficient and organized evacuation of residents.*



PHOTO: RICK ARTHUR

such as registration, food, lodging, and communications. Representatives from provincial ministries or municipal authorities are on hand to assist with inquiries and registration for financial assistance. Reception centres are often established in temporary tent camps, large public buildings such as schools, arenas, or armories.

### Evacuation procedures

Ordering an evacuation of all or part of an emergency area is a very serious step, and needs detailed planning. Evacuation procedures should be established well before they are needed. In case of a disaster they will provide an accountable and coordinated movement of affected persons. Residents will be better prepared for an evacuation if they are familiar with the emergency evacuation procedures.

Many lives have been lost during unplanned emergency evacuations because of rapid and erratic fire behavior. Heavy smoke or fire can make normally safe escape routes impassable. A calm, organized relocation of residents is much preferred to a last-minute evacuation in the face of oncoming fire.

The legal authority and responsibility for issu-

ing evacuation orders varies across Canada with provincial and territorial legislation and the nature of the emergency. Despite legal and jurisdictional variations, a multi-stage evacuation process is the most common approach to community evacuations.

### Evacuation process— the British Columbia example

The following material is adapted from the new B.C. guidelines for evacuation published in 2002 as *Operational Guidelines for Evacuations*. Each province will have regulations specific to evacuations. The following evacuation process is typical of these provincial regulations.

#### Three-stage evacuation process

The order to evacuate is only given after careful consideration of all the factors involved. Public safety is the most important consideration.

The three-stage evacuation process is used throughout the province of B.C. by all disciplines that deal with the evacuation process. It ensures that residents and the public receive a clear, consistent

message, regardless of the emergency, and that emergency personnel have a consistent process to follow in any situation.

Communicating effectively with interface residents is important. Wherever possible, provide written notification to residents for each step of the evacuation process.

### Stage 1: Evacuation Alert

The Evacuation Alert allows people to begin an orderly preparation to leave the affected area voluntarily, within a specified period. In practice, the evacuation order is often immediate and there is no time for an evacuation alert.

Warn residents that they should be prepared to evacuate, because of the danger of possible loss of life. At this point, moving handicapped persons, school populations, transient (vacation) populations, and any voluntary evacuees becomes a priority.

Distribute a public information bulletin or 'Fire Notice' during the evacuation alert, or when the evacuation order has been given. This bulletin will feature definitions of Evacuation Alert, Evacuation Order and All Clear.

In the bulletin, provide a section answering frequently asked questions, as well as details on emergency contacts, evacuation routes, marshalling areas, reception centres, and use of the emergency warning system.

**Delivering the Evacuation Alert:** If there is enough time, have volunteers or organized groups deliver Evacuation Alert pamphlets door-to-door to residents, under police direction or supervision.

Radio or television broadcast, sirens, loudspeakers, telephone calls, and electronic media could all be used in conjunction with this. A Fire Notice may be attached (or may have already been distributed).

Give residents travel route maps, reception centre addresses and controlled re-entry passes where applicable, in case an Evacuation Order is later issued.

### Stage 2 - Evacuation Order

To avoid the dangers of hurried last-minute evacuations, make and communicate the decision to evacuate early.

Inform everyone that they are now ordered to leave the area immediately in the interest of their own safety. An evacuation order does not allow for any discretion. All the bulletins, pamphlets, warnings, and orders emphasize that, while the evacuation order is in effect, access to the area will be controlled, and an access pass may be needed.

**Delivering the Evacuation Order:** Deliver the Evacuation Order door-to-door (time permitting) to occupants of residences within the affected area. A 'Fire Notice' may be attached (or may have already been distributed).

If residents have not yet been given travel route maps, reception centre address and controlled re-entry passes, they should now be provided.

### Stage 3 - All Clear

When the emergency is under control and the danger has passed, retract the Evacuation Order using the media and people are once again allowed to return to the affected area. Advise the residents that the danger may reoccur (caused by new ignitions or a change in the prevailing winds, for example) and an Evacuation Alert or an Evacuation Order may need to be reissued.

**Delivering the All Clear:** The All Clear order will not be delivered door-to-door. Inform occupants of residences within the affected area via media or at the Reception Centre information station.

# Actions for Individuals

## Protecting your Farm Resources — livestock and feed crops

### Livestock evacuation

**Livestock** – Owners should have an evacuation plan for livestock if threatened by fire. If your animals cannot be moved onto a safe area on your property, make and confirm transportation and feeding arrangements in advance. Obtain insurance coverage for all farm resources at risk from fire including crops and livestock - government disaster financial assistance is limited and only covers uninsurable perils.

The risk to farm animals can be reduced by preparing and maintaining fuel-reduced areas onto which stock can be moved and held during a fire.

Use a plowed or heavily grazed field with a minimum of grass or stubble - if possible, this field should be shaded and located well away from any forested areas and to the leeward side of your property. Water should be available.

Concrete or metal buildings located away from forest vegetation provide another livestock shelter option.

As a last resort, if you are unable to move livestock into a safer area, cut fences, turning the animals loose to take their chances with the fire—as long as there is no danger to people or vehicular traffic.

**Feed Crops** – Hay stacks, hay sheds and silos must be protected. Surround fodder reserves with a bare area - at least 5 metres wide - with another 20-metre wide fuel-reduced strip around this. Do not attempt to burn off around these areas. Graze, mow or slash grass to desired height. Dry hay before it is baled and stored to reduce the risk of spontaneous combustion. Store hay away from roads and fences. Hay and straw are fine fuels and vulnerable to ember ignitions.

Grazing livestock can be used to reduce flammable grass around buildings, fence lines and haystacks. Erect a temporary fence to enable stock to graze right up to fodder reserves to reduce the fire risk.



PHOTO: THE EDMONTON SUN
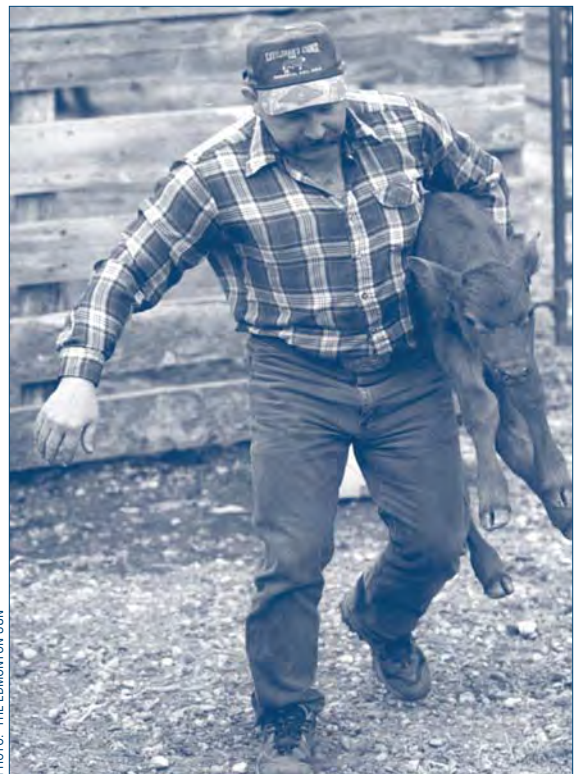


PHOTO: THE EDMONTON SUN

## *What to Do When Fire Danger is Extreme*

On days when the wildland fire danger is extreme, or wildland fires are actively burning in the forest adjacent to your property, be cautious and prepare for a worst-case scenario.

- Do what you can, but remember that as soon as an evacuation order is given, you must leave. Large moving fires are dangerous and should be left to professional firefighters.
- Ignite no new fires and report any open fires or smoke to authorities.
- Check fire pits and burn barrels to make sure they are extinguished. Be careful if smoking outside.
- Try to remain at home until the fire danger drops. Keep in touch with any absent household members.
- Keep the radio on all day, tuned to a local station. Have a battery-powered radio ready in case of power failure.
- Move grazing animals to a central safe refuge. Keep pets close to the house.
- Ensure your vehicle is fueled and mechanically serviceable.

## *What to Do if Fire Approaches*

If a wildland fire is immediately threatening your home, take the following steps:

- If you see a fire approaching your home, report it immediately by dialing your provincial forestry office, local fire department emergency number, or 911 where available.
- Activate whatever alert signal is used by your community disaster warning system.
- Dress properly to reduce risk of burn injuries - long pants and shirt of cotton or wool and sturdy footwear.
- Have firefighting tools and ladders propped against the house in a visible place.

## *When an Evacuation Alert is given*

If there is time before the fire arrives, take the following actions:

- Place valuable documents, family mementos and pets inside the car ready for quick departure if necessary.
- Park your vehicle adjacent the house in a cleared area (don't restrict fire service access) or in the garage, facing out with the windows closed and keys in the ignition.

**Outside the house**

- Cover all openings with metal coverings or fire-resistant material such as 12 mm plywood - this helps to keep sparks and embers out. Move any combustibles well away from the house or inside.
- Attach garden hoses to tap spigots and place them so they can reach any exterior surface of the building (including the roof). Place a connected sprinkler on the roof and nail it down. Do not turn it on unless the fire is an immediate hazard.
- If you have an outdoor pool or hot tub, make it as accessible as possible for firefighters. Fill garbage cans and buckets with water and leave them where firefighters can find them. Block downspouts and fill rain gutters with water.
- Turn off propane or natural gas valves. Clear vegetation and debris from around outdoor tanks.

**Inside the house**

- Close all windows and doors (closing interior doors will slow fire spread inside the home).
- Move combustibles away from windows and sliding glass doors.
- Fill sinks, bathtubs and buckets for use as extra water reservoirs. Attach inside hoses and gather buckets and towels.

## *When it is Time to Evacuate*

When you get the Evacuation Order, do not panic. Use your pre-planned route or as directed by authorities on site. Move away from the wildland fire, never toward it. If in doubt, use the principal evacuation route.

Drive carefully with headlights on, making way for pedestrians and emergency vehicles. Stop at the pre-determined marshalling point. Report in to authorities and wait for further instructions. Do not leave again without informing officials. Do not return to your property until permitted to do so by authorities.

# Interface Fire Disaster Response Strategies – Putting it all Together

Interface fire disasters share characteristics with other major natural or human-caused disasters threatening public safety. Emergency response professionals have strategies for disaster prevention, preparedness, response, and recovery that can be used to deal with interface fire disasters.

### Prevention programs

Prevention programs prevent or mitigate the effects of emergencies and include such measures as building codes, building use regulations, zoning, and land use management, fuel management programs, public education, legislation, and tax and insurance incentives and disincentives.

### Preparedness programs

Preparedness programs ensure that individuals and agencies will be ready to react effectively once interface fires have occurred. These include measures such as emergency plans, mutual aid agreements, resource inventories, warning procedures, training exercises, and emergency communications systems.

### Response programs

Response programs combat interface fires when they occur. Legislation allows a local emergency to be declared as needed. Response options include implementing emergency plans, activating emergency operations centres, mobilizing resources, issuing warnings and directions, and providing medical and social services help.

### Recovery programs

Recovery programs help restore the environment or communities to a pre-fire condition. They include physical restoration and reconstruction, economic impact studies, counseling, financial assistance programs, temporary housing, and health and safety information.

In most cases, provincially run recovery programs do not cover loss due to wildfires because a homeowner can purchase fire insurance.

It is important to ensure that you have adequate coverage including insurance for livestock and fencing. Government disaster financial assistance is also limited, and only covers uninsurable perils such as overland flooding.

# Wildland / Urban Interface Training

*Chapter Five presents a cross-disciplinary training system to develop specialized interface firefighting skills within existing fire organizations. It is based on existing and proposed training courses and simulation exercises for structural and wildland firefighters. Getting the right training is essential for firefighters' safety and their effectiveness in suppressing fire in the interface.*

## INTRODUCTION

Fire in the wildland/urban interface involves both buildings and wildland vegetation. Buildings can be ignited by firebrands or flames from wildfire that starts in the forest, or a fire that starts in a building or back yard can ignite brush or a woodpile and spread to the forest.

Traditionally, firefighters have been trained to deal with either structural or wildland fire, not both. Structural firefighters work in volunteer or full-time fire departments within communities. Wildland firefighters are employed by government ministries or, increasingly, by forest companies or contractors.

There are important differences in the formal training they receive and their understanding of how fire behaves. Usually, neither is trained in the other's fire environment.

It is an important principle of interface fire mitigation that firefighters in interface areas get the full range of training they need to respond to fires that involve both buildings and wildland fuels. Partners in Protection is involved in a cooperative effort to promote a certification program of *cross-training* for interface firefighters and supervisors. Cross training allows specialized firefighters from one discipline to acquire basic skills from the other discipline, so they can be effective interface firefighters.

Cross training is not new. Members of urban fire departments, especially if their municipality includes woodlands and forested valleys, often take wildland fire training, or conduct exercises with wildland firefighters. Similarly, wildland firefighters are often based in small towns, where they join— and train with—the local volunteer fire department, including taking courses in fighting structural fires.

## THE INTERFACE FIREFIGHTER

### Training Needs

Firefighters who are called upon to suppress both structural and wildland fire need basic training in safe structural and wildland fire-suppression tactics, equipment knowledge and requirements. Without this training, firefighters face an increased risk of fire-related injuries and fatalities.

Firefighting organizations in the wildland/urban interface must develop their members' skills at three different levels:

- Basic level training, to address firefighter safety needs and basic firefighting skills.
- Fireline supervisory training, to address safety, strategy, and tactics.
- Advanced training to address complex and mulit-agency situations.

### Cross-training Opportunities

This chapter uses the training programs already available in Alberta as an example of what can be accomplished by merging existing resources to meet training requirements for the specialized demands of interface firefighting. To learn more about training opportunities in other jurisdictions, check with your local or provincial fire agencies.

Many training facilities and agencies are collaborating to offer a cross-training program for wildland /urban interface firefighting. This joint program offers comprehensive training in both municipal and forest firefighting techniques. It consists of a combination of select courses creating multiple levels of training for the wildland interface firefighter – from basic firefighting practices to senior personnel in command procedures for mulit-agency interface response.

## Simulation Exercises

Cross training will not be complete unless all responding agencies have actively participated in a simulation exercise. The simulation must be realistic to ensure that all participants have a clear understanding of the exercise goals and objectives.

One of the main goals of these exercises is for the participants to have the opportunity to put in practice the concept of command and control, to ensure that a safe and efficient strategy and tactics plan will be developed specifically for an interface incident.

By using a carefully designed script, the participants will be briefed on the specific goals and objectives of the exercise. The use of maps, air photos, communication systems, and comprehensive equipment lists will be included in the exercise. The participants will develop and physically implement their plan to respond to the given situation.

During a simulation, the participants should be encouraged to use "what if" speculations, which are bound to generate both positive solutions and mistakes. These must be discussed during the debriefing phase of the exercise. The participants' exploration of different scenarios and the physical delivery of the plan is a critical part of the learning process that will improve their abilities to respond to future incidents.

The interaction between the role players and the participants is an essential part of the exercise; it ensures realism by providing instant feedback and guidance. At the end of the exercise, the role players will take part in the evaluation and debriefing process with all the participants. The evaluation must be done in a positive atmosphere; and, corrective recommendations must be dealt with in a timely and effective manner, to maintain the agencies' preparedness and efficiency to respond to an interface incident.



PHOTO: PARKS CANADA

# Cross-training Initiatives Available in Alberta

## Wildland/Urban Interface Cross Training Example

**Wildland Fire Fighter Training**

**Wildland/Urban Interface Training**

**Structural Fire Fighter Training**

- Wildland/Urban Interface Command (Proposed)
- Incident Command System 400

- Level I Fire Management
- Fire Fighting Strategies & Tactics (Theory)
- Pump A (S600)

- Fire Fighting Strategies & Tactics (Practical)
- Advanced Wildland Fire Behavior

- Incident Command System 200/300
- Emergency Site Management

- Advanced Wildland Fire Behavior
- Level II Fire Management
- Structural Fire Fighting (S200-400)

- Fire Fighting Strategies & Tactics (Theory)
- Pump A (S600)

- Fire Operation in the Wildland/Urban Interface (S-215)

- Incident Command System 100
- WFC Type I Member
- Introduction to Structural Fire Depts.

- Incident Command System 100
- Structural Fire Fighting Courses (S200-400)
- Wildfire Orientation

# DETAILED COURSE OUTLINES

Fully detailed course outlines and information about specific training courses are available from:

Hinton Training Centre
1176 Switzer Drive
Hinton, AB
T7V 1V3
Phone: (780) 865-8200
Fax: (780) 865-8266

Fire etc. Emergency Training Centre
5704-47 Avenue
Vermilion, AB
T9X 1K4
Phone: (780) 853-5800
Fax: (780) 853-3008
Toll free: 1-888-863-2387

Interactive CD-ROM training systems and references are also available to your organization or fire department to supplement the training delivered to your agency firefighters or to any other interested individuals.

The following CD-ROMs are available from UBC Press, University of British Columbia;

- *Principles of Fire Behavior*
  ISBN 0-7785-0073-X
- *Intermediate Wildland Fire Behavior*
  (U.S. version)
  ISBN 0-7785-0071-3
- *Canadian Forest Fire Behavior Prediction*
  (FBP) System
  ISBN 0-660-17600-9
- *Wildland Fire, Safety on the Fireline*
  ISBN 0-7785-0075-6
- *Canadian Fire Weather Index*
  ISBN 0-7785-0076-4

UBC Press,
University of British Columbia
2029 West Mall
Vancouver, BC,
Canada V6T 1Z2

Phone: 1 (604) 822-5959,
Fax: 1-800-668-0821
Toll free: 1-877-864-8477

# Communications and Public Education

**CHAPTER SIX** *is written for all those whose role is communicating effectively about wildland/urban interface fire prevention and control. While this chapter will not replace professional training in public relations, we hope it will give you some of the tools you need to start a public relations campaign. An effective program of education and awareness will help motivate people to create FireSmart communities.*

## INTRODUCTION

Effective public education is the key to preventing or minimizing fire risk in the wildland/urban interface. Political leaders, community planners, and people in the public and private sectors need to work together. But to do that, they need the knowledge to make informed decisions.

## PRINCIPLES OF EFFECTIVE COMMUNICATIONS

There are a few basic principles of effective communications that will dramatically increase your ability to reach your audience. These principles work, regardless of the communications challenge.

- Begin with clear, explicit objectives.
- Don't make assumptions about what people know, think, or want done. Take time to find out what people are thinking by using surveys, focus groups, or other research.
- Involve all parties that have an interest in the issue.
- Identify and address the particular interests of different groups.
- Identify with your audience. Put yourself in their place and recognize their emotions.
- Take time to coordinate with other organizations or groups.
- Choose your spokesperson carefully and ensure they have the training to communicate your messages effectively.
- Practise and test your messages.
- Do not either minimize or exaggerate the level of risk.
- Promise only what you can do. Do what you promise.
- Plan carefully and evaluate your efforts.

## DEVELOPING A COMMUNICATIONS PLAN

In communications, the importance of careful planning cannot be overstated. A communications plan will help you get started and keep you on track. With a plan, your communications activities are likely to be strategic and proactive. Without a plan, your communications may be scattered, ineffective, and reactive.

There are several benefits to developing a communications plan. The planning process will help you approach the issue strategically. Sharing a communications plan with your colleagues will help ensure that everyone shares the same goals and objectives. Submitting a communications plan to your superiors for approval will help get buy-in for your program.

The plan may also be useful in helping identify audiences, strategic considerations, and budget needs. Above all, the plan will help you evaluate your communications activities to measure your success.

An effective communications plan need not be complex. A simple plan executed well is more effective than a complex plan that gathers dust. This section will outline the important elements of a communications plan and give you a brief explanation of what you need to consider in each element. (A sample interface communications plan is also included in this chapter to give you an idea of what your plan could look like. See Page 6-8.)

## Elements of a Communications Plan

### Target audiences
• Who are you trying to reach? (Be as specific as possible.)

### Purpose statement
• What are you trying to achieve?

### Desired outcomes
• What results are you looking for?
• How will people's attitudes or expectations have changed when the communications program is complete?

### Current attitudes
• What do you already know about current attitudes through research, public consultation, or benchmark surveys?
• What information can you use as a starting point for measuring the change in attitudes or expectations?

### Strategy
• What is your approach to the issue?

### Strategic considerations
• What potential pitfalls or other factors could pull you off track?

### Messages
• What are you going to say to your target audience?

### Spokesperson
• Who will deliver your important messages?

### Timing
• When do you want it to happen?
• Where do you want it to happen?

### Tools
• Which communications tools are you going to use (media relations, print materials, audio-visual presentation, advertising, special events, internal communication, speeches, one-on-one visits, etc.)?

### Cost
• How much will it cost?

### Evaluation
• How are you going to evaluate whether the awareness program was effective?

# THE TARGET AUDIENCE

## Who Do You Need To Talk To?

Wildfire issues are ongoing, and involve a variety of audiences. But before you do anything, make sure your community fire agency is involved. If firefighters are already working with you, start your awareness program by targeting two audiences—elected officials and homeowners. Once you have developed the base of your awareness program, you can begin to target other groups, such as industry, municipal officials and land-use planners. One way to reach homeowners is through school programs.

The following audiences have a role in interface fire issues:

• Structural and wildland fire personnel

• Home and property owners and school-age children
• Elected officials
• Developers, building contractors, and building material manufacturers and retailers
• Insurance industry
• Media
• Municipal and provincial land-use planners
• Natural resource companies
• Municipal emergency response agencies
• Utility companies
• Tourism-related companies

Your challenge is to tell these groups about interface fire issues. To do this effectively, you will need to target each group with the right messages.

# Effective Messages

### All audiences

Messages should be simple and expressed in terms that are easily understood. All groups must understand these messages:

- Our community is located in an area where interface fire occurs.
- An interface fire incident will affect everyone in the community and every individual must take responsibility to share in the solution.
- During a major interface fire, firefighting resources can be limited. We can all help firefighters in protecting our homes and communities from interface fire.
- Prevention measures can save or significantly reduce the impact of interface fire on our family, home, business, or community.

As well as these, each of the following groups needs to receive specific messages.

### Structural and wildland fire personnel

Fire personnel will understand the issues surrounding interface fire. They make sure they have the training, resources, and mutual aid systems in place to respond to a wildfire incident. However, fire agencies may need to be reminded that they need to allocate the resources to develop and implement a successful wildfire prevention program in your community.

- You need a thorough knowledge of interface fire dangers in the community.
- Your fire agency is an essential part of an effective awareness campaign. Experienced firefighters are needed to give homeowners and business people the information they need.
- You can lead by example by making your own home FireSmart.

- You can support other firefighters' suppression and communication efforts (wildfire personnel work with structural firefighters and vice versa).

### Homeowners and school-age children

Reaching homeowners and children will be an essential part of your prevention program. The key to reaching this group is to inform them about the interface fire issue in your community and help them understand that they can make a difference. Keep your messages positive—don't frighten them or push your ideas.

This audience may not be receptive because they would rather not think that anything bad could happen to them. They may not like the idea of professionals telling them how to design their homes or landscapes. Some think that it is the fire department's job to save their home. Others think that prevention measures won't make a difference, or that they are too time-consuming and costly.

Homeowners need to know what interface fire prevention measures they can take to protect their home, family and community from wildfire. (See the fact sheets in Appendix 3).

- Protect the roof over your head.
- Maintain your priority zones.
- Break the chain of fuel (vegetation) around your home.
- Make your exterior FireSmart.
- Make sure your home is accessible to firefighters.
- Locate a water supply.
- Have a Structure and Site Hazard Assessment Form completed for your property.
- Prepare an action plan and practise it to know what to do when a wildfire is approaching your property.

### Elected officials

If elected officials don't know they have a problem, they can't make informed decisions about resources and policy changes that are needed.

- If we are prepared, the community will be able to recover from an interface wildfire incident.
- Effective prevention measures will reduce fire-related emergency response costs.
- Residents will appreciate that the municipality is making safety issues a priority.
- An awareness program doesn't have to be costly or time intensive. Neighboring municipalities or corporate sponsors can share the costs.
- It is irresponsible to do nothing to lessen the risk of an interface fire.

### Developers, building contractors, building material manufacturers and retailers

This group may not know that they can be a part of the solution.

- Promoting FireSmart development and products will enhance your reputation as an expert in your field.
- Your company will be seen as a good corporate citizen that cares about the community as well as the bottom line.
- Offering FireSmart communities and buildings will quickly become a selling feature and can give you a competitive advantage over developers and builders who do not practise such initiatives.

### The insurance industry

It is important that the insurance industry becomes actively involved with interface fire issues. They can be effective advocates for FireSmart homes and communities.

- Interface fire events are increasing in number and frequency.
- The cost of each interface fire incident is far greater than for a typical structural fire.
- Insurance companies have the means to motivate homeowners to take appropriate fire prevention action by rewarding (or penalizing) clients through their rate structure.

### Land-use planners

Municipal and public planners can take the initiative in including standards for reducing interface fire risk when developments or changes to the community's infrastructure are being considered.

- Minimize development in high-risk areas
- Stage development
- Minimize the length of cul-de-sacs
- Construct wide internal roadways
- Ensure an adequate water supply for firefighting
- Choose FireSmart building materials

### Natural resource companies

Utility, tourism, and other natural-resource-based companies must take steps to protect their buildings and businesses. Messages must be positive and non-intrusive. You can also give the prevention steps listed for homeowners to this audience. Because this group is relatively small, you could ask your fire agency to visit each business to talk about interface fire issues.

- Prevention measures can reduce injuries, save lives, save property, eliminate or reduce recovery costs and efforts, save jobs, maintain profits or ensure the long-term survival of the company.
- Your company will be seen as a good corporate citizen.



PHOTO: ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT

# Effective Media Relations

### Basic principles

There are a few basic principles that will make your communications with the media simpler and more effective:

- Be open with and accessible to reporters; respect their deadlines.
- Provide information tailored to the needs of each type of media.
- Provide background material on complex issues.
- Do not hesitate to follow up on stories with praise or constructive criticism.
- Try to establish long-term relations of trust with specific editors and reporters.

### Build partnerships

The media (television, radio, newspapers, and magazines) are usually good allies when it comes to delivering public safety messages. Local media people are members of your community and they look for stories that affect and interest the same public you want to reach.

However, while the media are interested in your issue and realize they can be an effective information medium, you should understand their business. The media are often more interested in simplicity than complexity; more interested in danger than safety. In addition, they can't always run your prevention story when they have breaking news to report.

Talk to your local media about the issue and give them story ideas. For example, if there has been a recent interface fire incident in the news or if the fire danger is high, tell the media. Give them the information they need to get your messages out to the public. Use news releases and the fact sheets provided in (Appendix 3) to feed the media the information you want to get out.

Involve your local weather personalities in your issue. Ask them to broadcast fire danger information in their weather reports. If the fire danger is extremely high, ask them to run single-line safety messages at the bottom of the television screen during their broadcast.

### When an interface fire happens in your community

Developing an effective relationship with the media also helps when an emergency situation or interface fire incident occurs. If there is one thing that can be guaranteed, it's that the media will be in your community during an incident. In an emergency, the public tunes into the local media for up-to-date information. You and the media must understand how you will work together to give the public timely and accurate information, so that they can be reassured that the emergency is being managed. Begin by making sure you have given someone the authority to respond consistently to media requests and questions, and make sure that person is available.

If the media understand that your community is well prepared for an emergency, they will usually cover the community's response in a favorable light.

If you fail to include the media in your planning process, or neglect to provide timely and accurate information during an emergency, it doesn't matter what positive measures your emergency responders have taken to combat the wildfire, you may still be seen as responding poorly to the incident.

### Writing a news release

Issuing a news release is an effective means of getting information out to the public through the media. In order for the information in the release to be used, it must be newsworthy and it must capture their attention.

Start with an attention-getting lead, the 25-words-or-less first paragraph. Keep the media's attention by telling your story directly and without wasted words.

Information to support your story should appear in subsequent paragraphs in descending order of importance. Answer the questions—who, what, where, when, why, how and how much. The release should not exceed one page. If the information you need to give the media extends beyond one page, develop fact sheets (maps, charts, safety information, statistics, for example) that can be sent out as attachments to the release.

Always list an available contact and telephone

number at the bottom of your release and make sure that person is available. There is no sense issuing a release if no one is available to talk to reporters.

Finally, save yourself some stress and prepare samples of media releases that you expect to need long before an actual interface wildfire event. And remember where you have filed them.

## *Doing a media interview*

Choose your spokesperson carefully (fire personnel, director of disaster services, or someone who is experienced dealing with the media). If possible, your spokesperson should be the community inter-face fire expert. Help your spokesperson understand and feel comfortable that they are the expert. If your spokesperson is not familiar with the media, arrange for cross training with information people who are familiar with interviewing techniques.

### Preparation

Advanced preparation is the key to a successful interview. If you have been working effectively with the media you probably have a positive relationship with the reporters in your area, and you will know a bit about their reporting style. Before you tackle a media interview, make sure you understand your interview rights.

Here are some tips to help you and your spokesperson prepare for the media.

- Before confirming an interview, determine and agree on the topic. Ask the reporter:

What is your deadline? (Respect the reporter's dead-line but also make sure that you have enough time to prepare for the questioning.)

Who else are you interviewing about the issue?

What angle are you using to develop your story?

- Set up the time, location, time limit, and logistics (sit down, stand up, etc.) for the interview.
- Prepare your key messages (See Page 6-4).
- If the reporter is from radio or television, prepare two or three 10- to 15-second sound bites that include your key messages.
- Think about the types of questions the reporter may ask. Sometimes a reporter will tell you what questions they will want answered.

### The interview

Consider providing your spokesperson with media training. Media training will give them the skills and confidence they need to deliver the right messages.

Here are some tips to get your spokesperson started:

- Start the interview by describing your story in a nutshell (who, what, where, when, why, how, and how much).
- Provide facts and evidence to support your story.
- State the benefits.
- Don't wait for the reporter to ask a question that will help you deliver your messages; use every opportunity you have to plug your messages.
- Use bridging phrases to direct the interview where you want it to go.
- Answer the questions with positive statements as much as possible.
- Do not use technical words or jargon.
- If you don't know the answer, say you don't know. Offer to find out and then make sure you get back to the reporter with the answer—before the reporter's deadline.
- Don't speculate or give personal opinions.
- Never use humor when talking about a high-risk situation.
- When you complete your answer, stop talking.
- Nothing is "off the record."
- Never say, "No com-ment"—it will give the impression that you have something to hide.
- Wrap up the inter-view by giving a sum-mary of your messages.
- Dress professionally. If you wear a uniform on the job, wear it for the interview.


PHOTO: PEGGY BERNDT

# Sample Interface Fire Communications Plan

The following is a *sample* of how your communications plan might look. In your community and for your target audiences, the content may be quite different, depending on many factors, including the awareness and knowledge that individuals may already have.

In this sample, the audience is defined as homeowners and elected officials. In your community, you can build on the success of this program by developing a later plan to bring others on board: business owners, public employees, or planners, for example.

### Target audiences
- Homeowners in the wildland/urban interface areas
- Elected officials

### Purpose
- Increase awareness of the risk of interface fire in the community.
- Give stakeholders the information they need to make informed decisions about preventing and minimizing risk from fire in the wildland/urban interface.
- Reduce the number of deaths and severity of injuries caused by fires.
- Reduce the number of fires and the extent of property damage that results from fires.

### Desired results
All parties will know that wildfire is an issue that needs to be addressed. They will understand that the problem belongs to the community and that each has responsibility for wildfire issues.

Officials will approve the resources needed to implement an interface fire awareness and risk management program.

Individual landowners and residents will be motivated to take preventive action.

### Current attitudes in the target audience
*(This will vary from community to community.)*

#### Elected officials
- Emergency preparedness issues are just not a priority right now.
- Wildfire has never been an issue for the community.

There may be a general lack of understanding of the importance of emergency preparedness.

#### Homeowners
- It's not going to happen to me.
- It's not my responsibility—it's the fire department's job to save my property.
- Our firefighters are well trained and they will save my home during a wildfire incident.
- I have fire insurance to cover my losses.
- Prevention measures are time-consuming and costly.

### Strategy

#### Elected officials
Provide them with information on the potential and scope of a wildfire incident in our community.

- Develop materials to support the need for an awareness program.
- Take supporting material to council and ask for their approval to implement an awareness program. Have your facts together and give council a clear understanding of the direction you want to go and what they can do to help you get there (land-use planning policies, resources, and funding, for example). Let council know that the costs and resources don't have to be extensive. Consider approaching neighboring communities or corporate sponsors to share the costs of implementing an awareness program.

### Homeowners

- Involve the public in the issue through research, surveys, and public consultation.
- Appoint a spokesperson to help you deliver the messages.
- Develop communication tools and methods to inform homeowners about the issue and what their responsibilities are before, and during, a wildfire.

## Strategic considerations

### Elected officials

- The amount of money and resources available
- Whether members of council agree on the importance of reducing interface fire risk
- Whether there is pressure from the public to do something about the issue

### Homeowners

- Whether they recognize the importance of reducing the risk of interface fire
- Whether they are willing to share responsibility for what needs to be done

## Messages

### General

Wildfire is a hazard in our community. (Depending on your development situation, you may need to say that the hazard of wildfire has increased in your community.)

A wildfire incident will affect everyone in the community and every individual must share responsibility for the solution.

During a wildfire incident there are not as many firefighting units as there are buildings in need of protection.

Prevention measures can save your family, home, business or community.

### Homeowners

Homeowners need to know what wildfire prevention measures they can take to protect their home, family, and community from wildfire (tailor these to suit your audience). (see Fact Sheets in Appendix 3):

- Protect the roof over your head.
- Maintain your priority zones.
- Break the chain of fuel (vegetation) around your home.
- Make your exterior FireSmart.
- Make sure your home is accessible to firefighters.
- Locate an adequate water supply.
- Have a Structure and Site hazard Assessment completed for your property.
- Prepare an action plan and practise it to know what to do when a wildfire is approaching your property.

### Elected officials

If something is done about prevention, our community will be better prepared to recover from an interface fire.

Effective prevention measures will reduce fire-related emergency response costs.

Residents will appreciate that our community is being proactive with safety issues—let's work toward a FireSmart community and long-term financial accountability and stability.

It is irresponsible to do nothing to lessen the effects of wildfire.

Land-use planners can do good work to protect the community when new developments or changes to the community's infrastructure are being considered.

## Spokespersons

Fire chief
Fire personnel or a fire prevention officer
Director of Disaster Services

## Sample Plan – *Continued*

### *Timing*

Fire season generally runs from April 1 to October 31.

For homeowners: during spring clean-up and planting season—just before the start of the high-risk fire season.

For elected officials: before the next year's budget is decided and well in advance of fire season.

### *Tools*

#### One-on-one contact (fire personnel)

Personal contact is a highly effective public education method to gain the respect of residents in the wildland interface. If residents respect the knowledge of fire personnel, or a fire prevention officer, and feel comfortable with their personality, they will listen to what the officer is saying and will be more likely to implement their suggestions. Your fire representative(s) needs to know about interface fire prevention and should also understand the principles of risk communications.

#### Newspaper articles or newsletters

Submit articles about interface fire issues to your local newspaper(s) or include them in local newsletters. Use the information provided in the fact sheets as a starting point but develop a local angle. If there has been a recent wildfire incident in your area, use the incident to help launch your awareness.

#### Wildfire Hazard Assessment forms

The most effective means of introducing hazard assessment is through fire personnel. With a little help, residents will be able to use the wildfire hazard assessment forms to determine the fire hazard for their home and landscape. (See Chapter 2).

### *Displays*

You will probably have a number of opportunities to set up a display in your community to promote wildfire prevention. Make sure the messages used in this display complement your awareness program. To draw people to your display consider including videos, firefighting equipment, posters and maps.

### *Cost*

Determine your budget and choose the communications tools that will give you the biggest bang for your buck.

Initiate cost-sharing arrangements with neighboring communities or corporate sponsors.

### *Evaluation*

Fire personnel will record the number of requests for fire hazard assessment forms.

If fire personnel conduct a hazard assessment, they will keep records of the increase in FireSmart homes and landscapes.

Get feedback from retailers, builders, developers or corporate sponsors on increased sales of FireSmart products.

If an interface fire should occur, the incident should be evaluated. The evaluation should determine which structures were saved because of wildfire prevention measures. Use this data to drive future awareness campaigns.

# Land Use Planning

**CHAPTER SEVEN** *outlines how effective planning can help communities anticipate and prevent interface fire dangers. Part 1 outlines the challenges facing planners as they attempt to balance the interests of all the authorities and residents who share responsibility for safety in the wildland/urban interface. Part 2 uses Alberta legislation and planning systems to illustrate how the planning process can tackle interface fire issues.*

## PART ONE: THE CHALLENGES

"There was a time not long ago that I could look at a forest and see trees. Now I can't help but see fuel."

RUSS DAUK, SUPERVISOR, PLANNING AND DEVELOPMENT, REGIONAL MUNICIPALITY OF WOOD BUFFALO, ALBERTA



PHOTO: BRIAN STOCKS

CHAPTER PAGE PHOTOS: PARKS CANADA AND RICHARD SEMENIS (FLAMES)

### Country Living Carries Risks

Fire, like flooding and other natural phenomena, is an integral and vital component of the wildland ecosystem. Along with natural decay, fire removes the buildup of forest litter, dead limbs, and fallen trees.

Development results in changes to this natural fire regime. When wildland fire is controlled and prevented, trees and forests grow old, and the amount of easily ignited fuel increases. Along with this fuel buildup, houses and businesses in the wildland/urban interface offer many new potential sources of fire.

### Fire protection is different out here

Fire protection service is linked to the size of the local population and, therefore, the number of tax-payers to share the cost. In wildland/urban interface areas where, by design, there are fewer people and more fuel, public fire protection is less available than in a more built-up area.

Fire protection agencies do the best they can

with the financial, equipment, and personnel resources available to them, but it is unrealistic to expect that all wildland development can be defended against every wildfire.

Locating development in wildland areas also directly affects forest management strategies. When homes are mixed with commercial timber, the emphasis of wildfire suppression efforts shifts from protecting forests to protecting the development within forests.

### Minimizing the risk of interface fire

Land use planning helps us foresee problems so that we can resolve or at least minimize the expected land use conflicts or incompatibilities. Minimizing fire risk is a land use planning issue in the wildland/urban interface. People involved in making planning decisions, fire officials, communities, neighborhoods, and individuals all need to work together.

Interface fire is not limited to country residential development. It can involve industrial, commercial, tourism and recreational development as well. It is also not limited to villages, settlements, or rural municipalities. The cost (just measuring value of property lost) of a wildfire in a large urban park or in a resort community or summer village could be staggering.

### A matter of liability

Governments, decision-makers, planners, and fire authorities must ask the following questions:

- What are the economic costs to individuals and the public of not managing wildfire hazards?
- Who is responsible for implementing protection programs against wildfire, and who will be held responsible if they are not implemented?
- What are the legal implications of not managing wildfire dangers?

In answering these questions, planners need to come to terms with the issue of liability, which is an integral part of risk management.

On one hand, planning for or managing wildfire (the risk) in the wildland/urban interface can limit liability by demonstrating an effort to manage the risk. On the other hand, planning can actually



PHOTO: PARKS CANADA

increase exposure to liability. Identifying and attempting to deal with preventing wildland/urban interface fire acknowledges that a risk exists. This has been a very difficult, even paralyzing, dilemma for a planning, subdivision, or development authority. As interface hazards and mitigating solutions become more widely known, this becomes less of a concern.

There is no quick fix or easy guide to planning for wildfire issues. The nature of planning itself does not allow every possible scenario to be accounted for and dealt with; but, planners can help find the best possible compromise by weighing the different interests and variables.

## THE CANADA ADVANTAGE

Fortunately, Canadians are becoming aware of the problem while our wildland/urban interface is still relatively small, compared to that in many other countries. In jurisdictions that have experienced heavy fire loss, it has been easier to get commitment to the need for planning. In many Canadian regions, there is an excellent opportunity to deal with the issue before a major disaster happens.
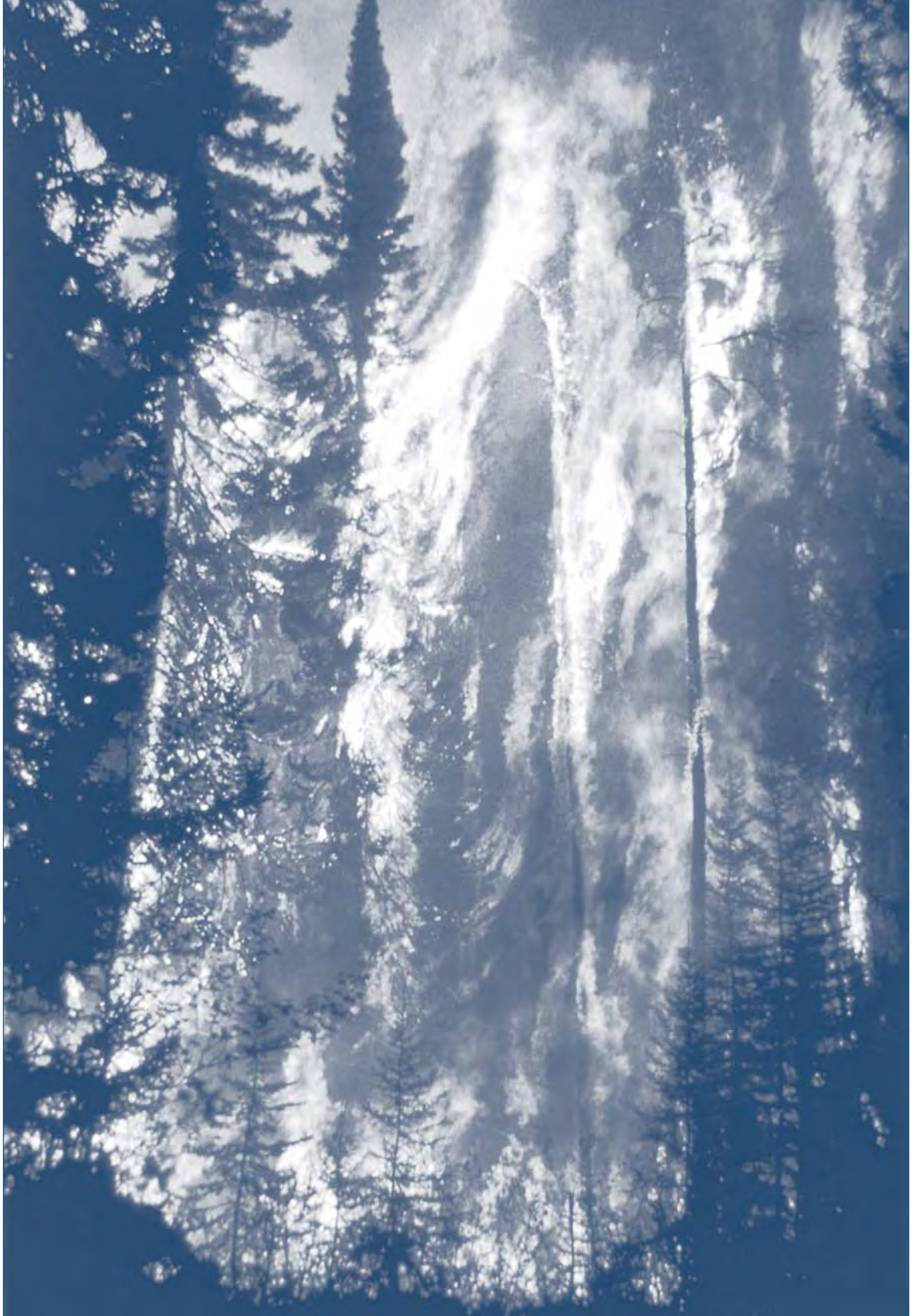
PHOTO: BRIAN STOCKS

## Similar Issues in Planning

The planning process has been applied to many other and similarly complex issues affecting the use or management of land. For many years, planning and development authorities across Canada have had to grapple with natural hazards (flooding, for example). Because watersheds and forests do not neatly fit into geopolitical boundaries, all three levels of government get involved.

The Canada-Alberta Flood Damage Reduction Program is an excellent example of how planning processes and principles have been applied to deal effectively with another significant land issue that affects federal, provincial, and municipal jurisdictions. This example should be reassuring to us in dealing with wildfire in the wildland/urban interface. While we may not be in a position to use this program as a model, it is a positive example of a federal/provincial initiative, expressed and implemented by municipal governments.

### Planning for floods

In many respects, wildfire is much like flooding as a natural hazard planning issue. What makes the shores of lakes and the banks of rivers appealing to people as places to live also makes them hazardous. These two hazards, however, are different in several ways:

- Identifying wildfire danger, although extremely important, is less precise than identifying flood hazards.
- It is easier to predict how floods behave and the factors that affect them, than it is for fire.
- Although property damage or loss due to either flood or a wildfire can be catastrophic, the threat to life in the case of wildfire is generally greater and much more likely to be the immediate focus of emergency response efforts.
- Wildland fire has been with us as long as flooding, severe weather, and other natural occurrences, but we are more aware of flooding and severe weather, and we have spent more time and effort in considering them. For example, we have developed quite elaborate mechanisms to deal with flooding including major federal/provincial partnership agreements and required development

setbacks from waterbodies in both provincial statutes and municipal bylaws. We have specific development standards and building code provisions for severe weather to reflect regional differences in snow load, wind load, etc.

### How can planners help?

Planners and others involved with planning and development in the interface are not expected to become wildfire experts. They should, however, use the technical information and resources available to them and lend their expertise to help develop and implement workable means of addressing interface fire issues. This is what *FireSmart: Protecting Your Community from Wildfire* is all about.

## Planning Within Realistic Limits

Planners need to consider and recommend solutions while recognizing that political, economic and social realities will always temper the course of action actually taken. Everyone involved in planning for interface fire needs to be acutely aware of this reality.

### Fire and forestry officials need to get in on the planning process

Fire and forestry officials and others with technical expertise should put themselves in the forefront of land development in the interface, and not wait to be asked.

Public safety, including fire protection, is an integral part of planning. Addressing public safety through the planning process, because of political, economic and social realities, may not be as direct or immediate as those involved with fire prevention and protection would like. As frustrating as the planning process may be, forestry and fire officials need to involve themselves early and often.

Working together with planners, they can develop policies, standards, and controls that will help ensure that potential or existing interface fire dangers do not threaten public safety.

The planner's role in addressing wildfire risks and mitigation is best achieved early in the planning process rather than when a development is well under way, expectations have begun to solidify, and commitments have been made.

### Cooperation among jurisdictions is critical

The various agencies and interests involved with this issue cannot work in isolation, or they may find themselves working at cross purposes. Federal or provincial initiatives may also conflict with local initiatives or not adequately account for local circumstances.

### Balancing competing interests

There will often be competing interests for land in the interface. For example, a fire and fuels manager, in planning to minimize wildfire, may want to maintain fuel-free borders, and to brush or thin

near structures or on slopes. At the same time and place, a biologist may be working to provide or protect wildlife corridors or habitat. Consultation between the two disciplines is essential.

Planners must also balance the inevitable differences in perspective among approving authorities and developers, although many of these conflicts or difficulties are not easily resolved. They also need to balance all the interests of individual landowners, community-based organizations, and the development industry. Often, there will be a middle ground between the extremes.

In attempting to implement wildfire protection or minimization strategies, it is likely that planning and development authorities will hear that their recommendations are unreasonable and they will ultimately make development untenable. While it is true that mitigation can be costly, it is important to weigh these costs against those of *not* protecting lives and resources.

### Planners on the front lines

Although often seen as regulators, planners are also educators and facilitators. They spend a lot of time and energy informing and advising developers, decision-makers, and the public of the various issues at stake in a particular plan, subdivision, or development. They are well positioned to increase awareness of the value of minimizing interface fire risk.

In rural and small urban municipalities in Alberta, the same person may be responsible for and actually carry out (not just manage) development control, planning, building inspection, public works, emergency services, and so forth. It is even more common for one person to carry out at least two or three of these functions (the same person could be the development officer, fire chief, and building inspector, for example).

These individuals' knowledge and outlook should make them both sensitive to and very capable of dealing effectively with wildfire in their respective interface areas. With implementation being so important, we are indeed fortunate to have on the front lines in many of our municipalities the abilities and perspectives of several "partners," all in one person.

Laws and rules, although important, are only one stage or manifestation of awareness. Building FireSmart communities depends on awareness and implementation at all levels. The public and its concerns are critical, interrelated players: both must be fully engaged. Public interest needs to be mobilized so that people buy in to the substantial merits (for them) of acting proactively. People who buy in are constituents, who, in turn, will mobilize their political representatives to devote the resources and willingness needed to complete this process successfully.

# PART TWO: HOW TO USE WHAT WE KNOW

This section describes the various mechanisms used in planning (using Alberta examples) and how they can be most effectively and appropriately applied.

Wildfire in the wildland/urban interface connects to planning at four levels: *land use; subdivision development and design standards; landscaping;* and *building construction.*

For example, reducing the fuel available to feed wildfire can be accomplished by providing for land uses such as logging, grazing, or golf courses. It can also be addressed in subdivision design through trail development, perimeter access roads, and park or playground space. Development standards can control fuels through conditions of approval, landscaping controls, or nuisance orders. Building construction standards can demand FireSmart materials and design.

This manual uses Alberta's planning systems to illustrate how provincial legislation and local government can be used to plan for fire safety in the wildland/urban interface. Users of the manual from other jurisdictions should be able to adapt this material for their use. Planning legislation is similar across the country.

In Alberta, the *Municipal Government Act* (MGA) establishes the authority for municipal planning, subdivision and development control.

## Using Land Use Planning

Land use planning begins with deciding on how suitable a development is for its site and how compatible it would be with existing and future uses for the land in the area. In the interface, planners need to factor wildfire into the land use equation when they are determining basic suitability and compatibility.

### Suitable land uses

To determine suitability, a planner looks at whether the land in question is capable of supporting the proposed use or uses, without the need for off-site services. Are there hazards that might preclude residential use, subdivision, and development? Will the needed hazard mitigation jeopardize the viability of the project?

Outside of built-up areas, water distribution systems are not often available or feasible, so that a development has to be self-supporting for this basic service. There should be enough water available on-site for drinking and fire suppression to serve the anticipated demand.

The potential for wildfire can make a development unfeasible (too costly to mitigate) or impossible.

Related to these on-site suitability variables are the off-site ones, such as the need for and the ability to provide year-round access and emergency and protective services. Will the distance from off-site services result in unacceptable costs or response time? What is the potential for access roads to be blocked by wildfire from adjacent upwind areas?

PHOTO:
SASKATCHEWAN
ENVIRONMENT

PHOTO: PARKS CANADA

▲ *In areas where interface fire danger is high, those land uses that reduce hazard provide safe refuge during evacuation.*

### Compatible land uses

As well as a proposed development being suitable for its site, it must also be a "good fit" with how the land is being used now, or could be used in the future. The ideal, of course, is to have land uses within a given area that do not conflict with one another, surrounded by land uses that similarly do not conflict.

In areas where interface fire risk is high, those land uses that reduce risk, provide safe refuge during evacuation, or supply water for fire suppression are listed as permitted. Examples include forestry, grazing, golf courses, airstrips, tennis courts, sports fields, swimming pools, and sod farms. In the wildland/urban interface, these amenity uses can also be effective firebreaks, making them complementary in a strategic sense as well. These amenities could also be intervening or mediating uses, buffering homes from less-compatible uses.

Land uses that may increase the potential for wildfires, or that may be a problem to adjacent lands or firefighting services during a fire, should be avoided if possible. Examples of such uses include used tire storage or disposal, bulk fuel storage, sawmills, lumberyards, electrical generation facilities, landfills, petrochemical operations or storage areas, and other such hazardous operations.

Similarly, land uses where human activity may be concentrated or where evacuation may be difficult should be avoided if possible or at least listed as discretionary uses. Examples include meeting halls, schools, work camps, day camps or retreat facilities, resorts, campgrounds, hospitals, seniors' facilities, and corrections facilities. Where such facilities are to be developed in the interface, they will need adequate infrastructure for wildfire protection.

## Using Policy Planning

The MGA provides for three levels of land use plans, all of which need to be consistent with one another.

### The inter-municipal development plan

Two or more municipalities can create an inter-municipal development plan if they want to plan for land in which each has an interest, or when a particular issue spans municipal boundaries. An inter-municipal development plan can be used for assessing hazards or planning for fire management or fuel modification in the wildland/urban interface.

### The municipal development plan

The municipal development plan establishes policies for land use for an entire municipality. It can address environmental matters and development

## USING A DIRECT CONTROL DISTRICT

The Municipal Government Act allows a municipality that has adopted a municipal development plan to take control over the use and development of land or buildings within an area by designating it a "direct control district."

The direct control district is a unique and powerful instrument. A municipal council may regulate and control the use and development of land or buildings in any manner it considers necessary. The council can administer the district itself (that is, actually deciding on applications received) or delegate specified powers to other decision-making bodies. This designation does not include a specific listing of prescribed uses.

A municipality could safely use the direct control district tool to implement policies on wildfire in its wildland/urban interface. If the municipal development plan designates a particular wildland area as well suited for multi-parcel country residential development, the municipality can get more information about mitigating wildfire danger in the area by creating a direct control district. In this way, council could require the information it needs before deciding on the merits of a development application.

constraints as well as incorporating the results of studies or impacts analyses, so it can incorporate wildfire danger assessment and even mapping.

### The area structure plan

The area structure plan further specifies the direction provided in a municipal development plan. The area structure plan provides a framework for subsequent subdivision and development of a particular area of land.

An area structure plan is usually part of a major subdivision or development proposal, so it could be an ideal mechanism to begin addressing wildfire danger assessment and risk mitigation in a relatively manageable area.

The terms of reference of an area structure plan could include at least a basic assessment of slope, aspect, fuels, and wildfire incidence. A more detailed hazard assessment could be required, depending on the wildfire circumstances of the subject area, or the nature and scale of the proposed subdivision and development.

The area structure plan also provides an opportunity to examine several factors that would affect interface fire risk and mitigation, including:

- land uses and density
- access (right-of-way width, travel surface, emergency access)
- public utilities (enough available water for fire suppression)

### Getting fire and industry managers involved

The MGA establishes a set of referral provisions for municipalities in preparing the three policy plans discussed above. Those affected by these plans must be allowed to make suggestions and representations.

Fire authorities and forest or wildland managers should be closely involved in preparing a plan, preferably early in the process. They should also be involved when there are any amendments proposed to an adopted plan.

### Using the land use bylaw to protect the wildland/urban interface

In Alberta's planning system, the land use bylaw is an important means of regulating the use and development of land within a municipality's boundaries.

The bylaw divides the municipality into land use districts (referred to as "zones" in other jurisdictions). It delineates two categories of land uses within each land use district: *permitted uses* (which are allowed if the application conforms to the bylaw) and *discretionary uses* (which may or may not be allowed). It establishes subdivision development and design standards in general for each land use district as well as, a process and requirements for issuing development permits.

Although the extent to which municipalities choose to, or are required to engage, in policy planning varies greatly, every municipality in Alberta must have a land use bylaw.

The Act gives tremendous latitude to a municipality both in terms of what it can address in its bylaw and how to do so. Thus, there are many opportunities to incorporate provisions related to interface fire risk and mitigation. As well as dealing with developed sites, the land use bylaw can be used to regulate the accumulation of fuels on undeveloped lots within subdivisions. This is often an issue to interface residents.

## *Using development permits*

The MGA empowers (in fact, compels) a municipality to decide on development permit applications and provides the authority to impose conditions on the approval of permits. These conditions can be used to uphold the bylaw as well as the intent and objectives of its municipal development plan or other plan in effect.

With certain statutory exemptions, all development undertaken within a municipality's jurisdiction must comply with its land use bylaw, but most municipalities do not require a development permit for all development. They usually exempt from the permit process any development they consider "insignificant" in terms of its impact, (such as the placement of small garden shed) or temporary (a lawn sign advertising a garage sale, for example). Municipalities also exempt developments from the permit process for reasons of efficiency or a lack of resources.

Municipalities do have the authority under the MGA to make exceptions, or vary most of the provisions of their bylaw, and situations do arise where



PHOTO: RICK ARTHUR

variance is justified. Many municipalities, however, do limit variance powers in their bylaw to avoid relaxation becoming the rule rather than the exception.

The development permit process is the primary means of informing residents of their municipality's development requirements and standards. As such, the permit process can be an opportunity to raise awareness of wildfire risk and minimization, especially when those administering the bylaw explain to applicants the reasons for the provisions.

Municipalities should consider this when exempting a project from the development permit process, particularly in interface areas where wildfire risk is high.

### Getting information about interface fire risk

Decisions about development permits should be based on as much relevant information as possible, including information about wildfire risk. Information normally gathered as part of a development permit application can help in assessing wildfire risk. For example:

- The proposed use of the subject lot or building, especially in relation to adjacent use and building (**to get an idea of building separation, fuel modified area, etc.**);
- The location of buildings and other structures in relation to one another within the subject lot and in relation to buildings and structures on adjacent lots and proposed front, side and rear yards (**to assess wildfire risk at the level of basic land use, both existing and proposed**);
- Landscaping, including buffering and screening where provided (**to assess the amount and type of fuels**);
- Access and internal traffic circulation (**for safe access for fire and other emergency equipment and for resident evacuation**);
- Proposed exterior building materials (**for combustibility**); and
- The location of existing and proposed fire suppression infrastructure (**to determine response effectiveness, including response times and water supply**).

Interface checklists, like those provided in Chapter 2, can be useful for this purpose.

### Architectural controls

Often a bylaw's provisions related to building design, character, and appearance include reference to establishing architectural controls for this purpose. These usually take the form of a restrictive covenant registered directly or by caveat against the titles of the lots in a subdivision. More recently, these controls have included the landscape as well.

These provisions address the qualitative and imprecise issues of esthetics and amenity, but they can also control building and landscape design and construction to minimize fire danger.

At the design stage, while expectations are still somewhat elastic, a municipality's planning and fire personnel can work with developers, builders, and purchasers. They can explain the merits of FireSmart alternatives in roofing and wall finish, or the importance of thinning the understory, reducing ground level fuels, or the proper stockpiling of firewood and other combustibles. (See Chapter 3)

## Using Subdivision Development and Design Standards

At the level of subdivision development and design standards, planners focus their attention on variables such as topography, parcel density, layout, and infrastructure (servicing) requirements such as external road access and internal traffic circulation.

### Working at the subdivision level

The Act compels a municipality to establish a subdivision authority to decide subdivision applications. This authority should require applicants to follow the municipality's policies and provisions for managing interface fire risk.

As is the case with development permits, the information a subdivision authority would normally gather as part of an application can also help assess wildfire risk. For example, a subdivision authority can require information about:

- The proposed use of the subject lots or buildings, especially in relation to adjacent uses and buildings (**to assess wildfire risk at the level of basic land use, both existing and proposed**);

- The location of buildings and other structures in relation to one another within the subject lot and their proposed uses (**to get an idea of building separation, fuel modified area, etc., and to assess wildfire risk at the level of basic land use, both existing and proposed**);
- The location of any waterbodies or watercourses within the subject lot and in the immediate vicinity (**to identify potential water supply for fire suppression**);
- On-site water supply and the location of any waterbodies or watercourses within the subject lot and in the immediate vicinity (**to identify groundwater capacity and potential for surface water supply for fire suppression purposes**);
- The topography of the lands in question, including contour mapping at a fairly detailed interval, and the surface conditions and vegetation cover of the subject and adjacent lands (**to help determine orientation and degree of slope and the extent to which vegetation management might be limited because of the risk of soil erosion**);
- Access and internal traffic circulation (**for safe access for fire and other emergency equipment and for resident evacuation**); and
- Proposed fire management or fire suppression infrastructure. (**A municipal subdivision authority should contact the municipal fire chief or the local forest manager before the subdivision application is accepted as complete**.)

### Using subdivision and municipal design standards

When deciding an application, the subdivision authority of a municipality must follow the provisions of the Municipal Government Act and the regulation. It must also follow the intent and objectives of its municipal development plan, any area structure plan in effect, and its land use bylaw. Wildfire is now formally embedded in Alberta's planning policies, along with flooding, slope instability, and other hazards. Mitigating wildfire risk in the wildland/urban interface can be part of the municipality's

- Development standards bylaw
- Subdivision design standards or guidelines

- Subdivision layout
- Subdivision density
- Subdivision staging
- Access and infrastructure
- Water supply management
- Management of vegetation and fuels

### Development standards bylaw

Most municipalities have a development standards bylaw that outlines its requirements and specifications with respect to roads, water distribution systems, sewerage, stormwater management, and other components of subdivision and development. Many municipalities will also have subdivision design standards or guidelines. These guidelines might include requirements or preferences for internal road patterns, the length of cul-de-sacs, lot sizes, spacing of playgrounds, or the placement of pedestrian walkways or connections.

Road access, fire suppression infrastructure, and other design basics need to be planned for when the subdivision is being created. Their role in fire safety should be an integral part of the design. Once a subdivision is developed and the structures are built, retrofitting for fire safety, particularly if it involves infrastructure (roads and fire suppression, for example), is invariably more expensive and usually less effective.

To help address interface fire risk, municipalities should reexamine their existing development standards bylaws, particularly for water supply, water delivery, and roads.

Transportation, engineering, planning and emergency services staff may find that their existing development standards need updating. They are likely to find, for example, that the development standards for fire protection are based on the risk of fires originating inside structures, not from the wildlands surrounding the structures.

### Subdivision design standards or guidelines

In terms of interface subdivision design standards or guidelines, there are some basics with respect to subdivision shape, density, phasing, accessibility, water supply and perimeter protection buffers that a municipality should establish for its subdivision authority to implement. (See Chapter 3 for detailed recommendations.)

## Subdivision layout

Wherever possible, subdivision shape should minimize development perimeters to reduce interface hazards. Patterns of development that tend to create areas of congestion (bottleneck or hourglass shapes) or that isolate pockets of development (long cul-de-sacs, for example) should be avoided.

## Subdivision density

The density of a wildland development is important as well. It has often been assumed that higher density wildland developments are beneficial, as they tend to reduce the size of the wildland/urban interface perimeter and tend to reduce the amount of remaining vegetation (fuel). But higher density wildland developments can generate a more extreme fire danger, depending on how susceptible the dwellings are to ignition in case of wildfire. Fire can also move from structure to structure within high-density developments.

A high-density wildland development consisting of highly fire-resistant dwellings is desirable indeed, while a similar cluster of dwellings highly susceptible to ignition would represent a hazardous and undesirable situation. The goal is to find ways for the dwellings to survive.

In an urban model, fires are more likely to originate from within structures, spreading to adjacent structures over a relatively longer period. Fire suppression response times are comparatively short.

Building spacing needs to be greater in interface areas than in the urban model. Structures in a wildfire are much more likely to ignite from the outside (from embers or direct heat and flame, for example) and emergency response times are considerably longer.

As an absolute minimum, 15 to 20 metres of space separating dwellings is required to minimize the spreading of fire. Buildings located on slopes need to be spaced even further apart because of the more rapid spread of a fire moving up a slope. Clustering development so that dwellings on smaller lots are grouped to reserve more community open space can also improve fire safety if the buildings are adequately spaced and native vegetation is modified appropriately within the clusters.

## Subdivision staging

Phasing or staging is also important. FireSmart development should occur initially along the interface perimeter of the subdivision. Reducing the area of interface fire danger as quickly as possible will tend to minimize the risk of wildfire to the entire subdivision. In this sense, development brings about fire protection. Even attaching new FireSmart developments to existing developments — that may not have incorporated wildfire protection measures — may help protect the existing development by reducing its hazard perimeter. A series of scattered interface developments, or randomly staged ones, may leave a relatively unbroken chain of fuel to threaten individual buildings until development is substantially completed.

## Access and infrastructure

One of the most important aspects of interface subdivision and development from a fire protection viewpoint is access. Roads and road networks should provide for simultaneous access for emergency equipment and for evacuation of residents. Roads and bridges must be capable of handling large firefighting apparatus, and withstand ongoing use for these purposes without significant deterioration. Road grade and curvature cannot be excessive.

A municipality's development standards bylaw is the most appropriate place for the infrastructure standards and specifications it develops for interface subdivisions. These road and other infrastructure standards do have a direct bearing on subdivision design and should be fully addressed at the subdivision design stage.

Emergency access needs to be incorporated from the beginning of the subdivision process. This should apply whether or not the subdivision has public roads or whether the subdivision is a condominium where the internal roads are private (part of the common property). Municipalities that allow lower internal road standards in the case of condominium subdivisions should consider if this would compromise emergency access.

## Water supply management

Water is still the most important tool for fighting wildland fires. Thus, a large, dependable, supply of water for fire suppression — above that required for domestic use — must be provided at the time of

subdivision design. The specific amount of water needed and how it is delivered will depend on the degree of wildfire danger and the nature of the development.

### Vegetation and fuels management

Where possible, fireguards should be included around each subdivision, to act as a buffer between the wildfire danger (fuel in the form of vegetation) and the combustible structures within the subdivision. See Chapters 2 and 3 for a description of the specific vegetation management needed within a subdivision, and for information on building community fireguards.

While the primary purpose of the community fireguards is to reduce or eliminate fuels near structures, there are a number of other benefits. The buffer increases the separation distance between the structures and a high-intensity fire. The fuel-free and fuel-reduced spaces reduce the likelihood of embers and firebrands starting more fires. In addition, firefighters have the benefit of additional access for firefighting and a safe retreat from which to

begin back burning or other hazard reduction operations.

If an access road or trail is not incorporated into a community fireguard, access lanes to the fuel modified areas must be provided. The access lanes should be wide enough to accommodate fire equipment (e.g., a pumper truck) and be spaced so that a number of access points are available if any become blocked. Buffers must also be maintained regularly if they are to be of any use. Regrowth in cleared areas can soon become as significant a fire danger as the original vegetation.

These perimeter fire protection areas can also serve other functions and be fully integrated as recreation features. For example, the fuel-reduced zone may be made up of strip parks, walking or ski trails, or golf courses (if they are properly designed). Water hazards associated with golf courses can be particularly helpful if they are well located and emergency vehicles have adequate access to them. Other developments that may serve the purpose of perimeter fire protection include parking lots and athletic fields.

▶ *Where possible, fireguards should be included around each subdivision.*



PHOTO: RICK ARTHUR

## Considerations for Environmental Reserve Land

A subdivision authority may require that ravines, gullies, naturally occurring drainage courses, floodplains, unstable slopes and other lands potentially hazardous to development (or vice versa) are provided as environmental reserve. Environmental reserves can also provide public access to the bed and shore of waterbodies or to prevent pollution of these waterbodies or their watersheds.

The environmental reserve land can become a separate lot owned by the municipality, or it can be the subject of an environmental reserve easement registered by caveat. In the case of an easement, the private owner retains title to the land in the environmental reserve.

Although there are exceptions specified, the Act generally requires that an environmental reserve stay in its natural state. For example, a steeply sloped and heavily treed riverbank or ravine protected under an environmental reserve would remain undisturbed.

While a steeply sloped riverbank or deep ravine are made environmental reserve because they are a hazard to development, the environmental reserve itself often becomes an important design or amenity feature of the subdivision. It is highly desirable from a marketing perspective to locate dwellings at the top of such features, to take advantage of the view.

With fire as a natural and integral part of wildland ecology, the natural state of our tree-covered ravine or riverbank has included fire in the past and, if left undisturbed, would include fire again. The residents at the top of the slope are not likely to accept fire as a part of the "natural state" of the view they overlook.

The intense demand for dwellings at the top of steeply sloped and heavily treed banks may translate into dwellings at risk, especially if they are downwind from unbroken forest cover.

We know that vegetation management, particularly when development is on or near slopes, can help minimize wildfire risk. Tree thinning, pruning, clearing understory and litter, prescribed burning, etc., can all be effectively used to this end. These activities, however, may not only conflict with the expectations of nearby residents but the overall requirement in the MGA for environmental reserves to be left in their "natural state." It is important to make residents aware of the merits of vegetation

management to prevent wildfire from taking its course, which can not only spoil the view and destroy wildlife habitat, but also threaten their homes and personal safety.

Municipalities may want to consider modifying environmental reserve standards to permit fuel modifications where they are needed for the mitigation of interface fire risk.

## Landscaping

In Chapter 3, the importance of managing the vegetation in the interface was discussed, including how the choice and maintenance of landscaping can reduce the fuel available for wildfire.

Planners can help by making landscape architects aware of the importance of vegetation management alternatives for dealing with interface fire risk. Landscape architects, with their knowledge of plant species and their expertise in landscape design, could be valuable partners in dealing with this issue, especially when it comes to blending safety with aesthetics.

## Building Construction

Because planners are less involved with building construction than with land use, subdivision design, development standards, and landscaping, they are slightly more limited in their ability to deal with the wildfire issue at this level.

Planners can address this aspect of the issue through development control. Design guidelines, architectural controls, and land use or zoning bylaws can be used to regulate the siting of buildings as well as building design, character and materials.

Fire and building codes cover fire safety standards for buildings, building materials, and construction. The issue of appropriate buildings, building materials, and construction in the interface is addressed most effectively through revisions to these codes. This manual represents an important resource in that process.

## Getting All Levels of Government Together

Municipalities and provincial departments and agencies are encouraged to consult with one another in land use planning. Provincial legislation, policies, and programs for land use planning and resource

management can affect municipal interests, while municipal decisions and actions on local development can affect the success of provincial objectives.

It is important that federal, provincial, and municipal authorities work together when public lands are leased or sold for subdivision or development. The best time to address interface fire risk and minimization is when the interface is created.

At the municipality's discretion, development permit applications can also go to external agencies for comment. For example, referral to the senior government forestry departments will bring more information and help establish and maintain ongoing communication, all of which assists the municipality in dealing with interface fire risk. This would be particularly important when the subdivision in question also involves the disposition of public land, so that both authorities can coordinate their efforts (e.g., design requirements, conditions of approval) to address wildfire risk and minimization.

When an accompanying policy plan (an area structure plan, for example) has identified the need, a municipality may require fairly detailed information about proposed fire management or fuels modification. Before accepting a development permit application as complete, a municipal planning and development department should contact the fire chief or the local forest management office to see if they have any concerns about it.

Once a development permit application is accepted, it usually circulates internally. The municipality's public works department, engineering staff, and recreation director then have the opportunity to express their interests.

Those responsible for emergency services, particularly the fire department, should also be included in this review. Fire and other emergency service personnel need to make their concerns, comments, and requirements known to the planning and development staff early, often, and forcefully.

# Communities Taking Action – *Templates for Success*
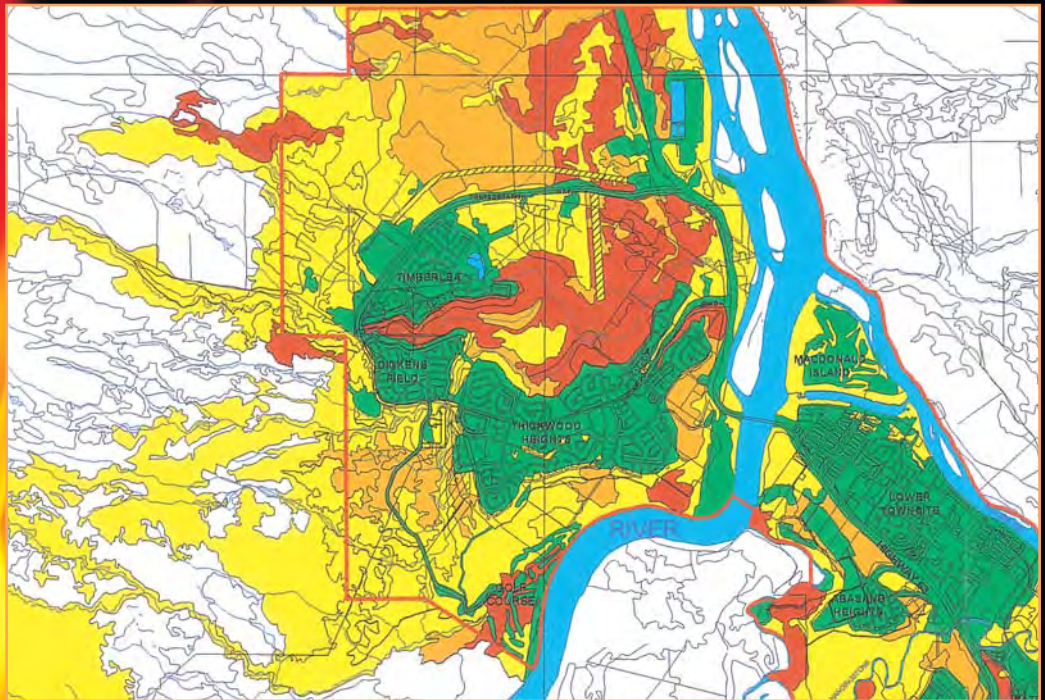
**Chapter Eight** *Case studies of seven communities are presented in this chapter. The communities were chosen for the geographic range each community represents and for the different approach each is using to mitigate the interface fire problem.*

## Seven Stories

▶ *Geographic locations of Chapter Eight case studies.*

These case studies are examples of communities that have recognized the interface fire problem and have acted to minimize the risk to wildfire. They are considered "templates for success" in the wildland/urban interface. The case studies outline what actions were taken and why, how they were carried out, and how conditions in the community have changed as a result of the mitigative work.
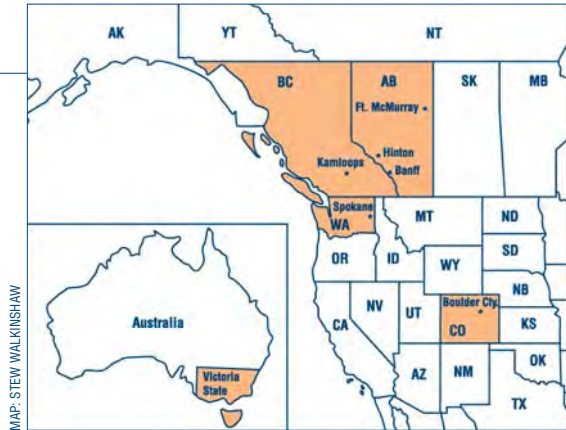
MAP: STEW WALKINSHAW

▼ *The City of Fort McMurray – Site Hazard Map.*



CHAPTER PAGE PHOTOS: STEW WALKINSHAW AND RICHARD SIEMENS (FLAMES)
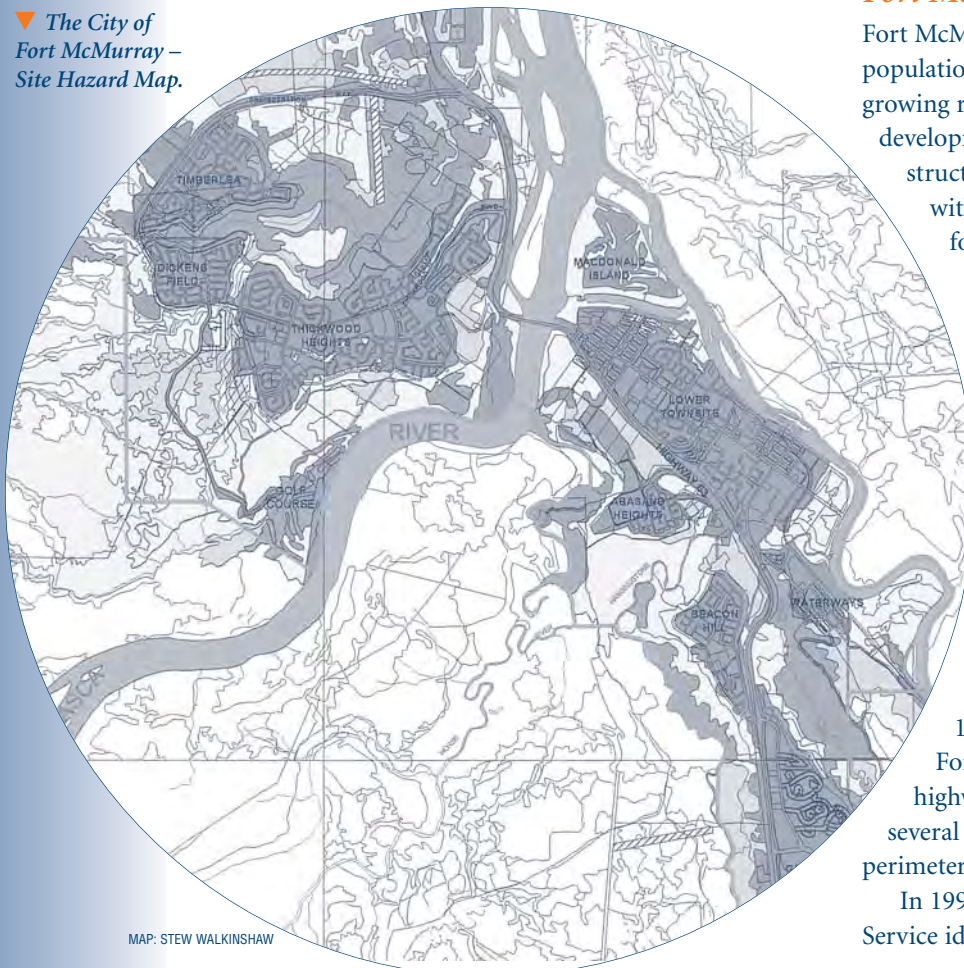
MAP: STEW WALKINSHAW

### Fort McMurray

Fort McMurray, in northeastern Alberta, has a population of approximately 40,000 people and is growing rapidly because of increasing oilsands development in the region. Residential home construction is occurring at unprecedented levels, with many developments located in or near forested areas.

Wildfire is a common occurrence in the region, from within the city limits and from large uncontrolled wildfires advancing towards the city. Wildfire has threatened homes in Fort McMurray several times in the past. Fires within the city limits in 1980, 1986, and 1995 threatened buildings and resulted in joint fire suppression action between Alberta Environment, Land and Forest Service and the Regional Municipality of Wood Buffalo Fire Department.

The Marianna Lake fire, in May of 1995, advanced to within 50 kilometres of Fort McMurray and led to the closure of the highway into the city and the construction of several hastily planned fireguards around the perimeter.

In 1997, Alberta Environment, Land and Forest Service identified Fort McMurray as one of three

pilot communities to start a multi-faceted interface fire planning process. The goal of the project is to provide a document that will guide provincial and municipal government officials, land developers, and the public to turn the city into a FireSmart community, while retaining and enhancing the forested environment. Alberta Environment, Land and Forest Service, and the Regional Municipality of Wood Buffalo are partners in the development of the plan.

The Fort McMurray Wildland/Urban Interface Plan assesses sites at risk for interface fire within the city limits and identifies priorities for mitigation. The result of this phase of the project was the completion of a four-hectare fuels modification project that significantly reduced the wildfire danger for a new residential subdivision.

The multi-faceted plan also studies and makes recommendations on development options, legislation, public education, inter-agency cooperation and cross training, and emergency planning.

The plan makes many recommendations that, if followed, will help Fort McMurray develop into a FireSmart community. Some, such as the fuels modification and interagency cooperation, have already been implemented successfully and have put the Fort McMurray initiative well on the way to becoming a success.

## Town of Hinton/Yellowhead County

Hinton is in west central Alberta and has a population of approximately 9,500 people. Development has occurred at a moderate pace over the past 10 years. There are several developments adjacent to forested areas within the town limits. Throughout the 1980s and 1990s, there has been a significant increase in country residential and tourism-related developments on private lands in Yellowhead County, outside the town limits.

Wildfire has not been a serious threat to development in the region in the past but the community recognizes the potential for an interface fire event.

### Entrance Ranch fire

In December 1997, a wildfire started in Yellowhead County, north of the Town of Hinton that resulted in the loss of one home and several outbuildings on the Entrance Ranch. Several residents in the downwind path of the fire were evacuated or put on evac-



PHOTO: STEW WALKINSHAW

▲ *The Entrance Ranch fire in December 1997 resulted in the loss of one home and several outbuildings.*

uation alert. Emergency response agencies, including Alberta Sustainable Resource Development, Town of Hinton Fire Department, Yellowhead County Fire Department, and the RCMP were overwhelmed by the speed of the fire and the resources needed to deal with an interface event.

In August 1997 the Hinton/Yellowhead County region was chosen by Alberta Sustainable Resource Development, as one of the three pilot communities for interface fire planning. The planning process for the region was similar to the Fort McMurray initiative. The Hinton/Yellowhead plan was also different in that it included the cooperation of both the Town of Hinton and Yellowhead County municipal governments and included country-residential subdivision and tourism facility development that was not present in Fort McMurray.

Committee members for the Hinton/ Yellowhead Region plan included representatives from Alberta Sustainable Resource Development, Yellowhead County, Town of Hinton, Foothills Model Forest, Weldwood of Canada - Hinton Division, the Hinton and District Chamber of Commerce, and the Environmental Training Centre. The diverse viewpoints of each member resulted in a complex and interesting multi-faceted interface fire plan.

The plan identifies several priorities for vegetation management, public education, legislation, structural and infrastructure options, interagency cooperation, and emergency planning. Committee members meet on a regular basis to set annual goals for achievable priorities and to continue discussion on the interface fire issue in the region.

The Entrance Ranch fire brought an element of

reality to something fire managers have been trying to warn the public about for several years. The Hinton/Yellowhead Wildland/Urban Interface plan will result in the reduction of hazards to existing developments; and, the development of new communities with wildfire danger built into development considerations. With the education of the public and of municipal and provincial government officials in interface fire issues, and an ongoing dialogue among fire managers in the region, development in the Hinton/Yellowhead region will be FireSmart.

The Hinton/Yellowhead Wildland Urban Interface plan has been initiated, with approximately 50 hectares of hand thinning, pruning and cleaning completed in Hinton and outlying developments by December 2002. Plans have been completed for two other communities within the region, and hazard reduction work is ongoing in these communities as well.

Initial assessments have been completed on a number of other communities and developments within the region. Plans are underway to begin assessments on the remaining communities and developments, and to begin building hazard reduction plans for those most at risk.

## The Bow Corridor

The Bow Corridor covers an area from within Banff National Park to the forested areas east towards Calgary. It includes a number of interface communities, of which Banff and Canmore are the largest. The area falls under the jurisdiction of a variety of federal, provincial and municipal governments and is administered accordingly.

Prior to European settlement, fire was a frequent and common disturbance in the surrounding forest regime. Between natural fire and aboriginal burning for habitat management, the valley bottom had a short fire return interval. Fire occurred less frequently in the upper slopes of the valleys.

In the 1880s, a massive fire burned most of the Bow Corridor, but since then, wildfire has become virtually non-existent. This has resulted in heavy accumulations of continuous fuel and an aging forest community that is more susceptible to insects and disease.

The risk for a massive stand replacement fire such as that in the 1880s is considerable. This time, though, the risk has a high price tag; the area now has values in the billions of dollars. There would be
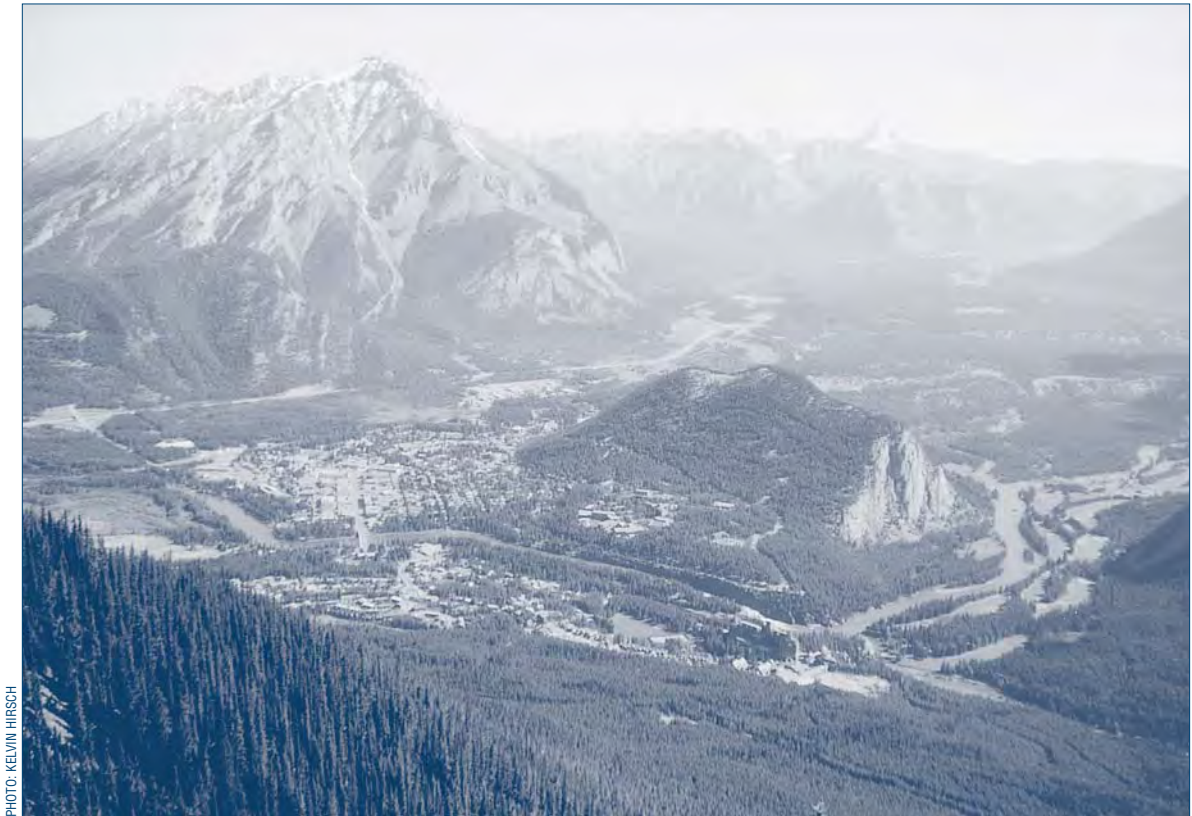
▶ *Banff townsite*



PHOTO: KELVIN HIRSCH

extensive damage and loss from a high-intensity fire adjacent to the urban fringe, or a distant wind-driven or convective fire that hurls burning embers into the communities or other outlying developments.

In recent years, there has been a significant increase in the scale of development within the Bow Corridor in all communities, and properties have increased in value significantly. Development in recent years has involved little consideration for the threat of wildfire or for the accumulation of forest fuels within the development.

Residential homes, commercial developments, and tourism facilities extend into the surrounding forest, with many of the buildings built from flammable construction materials. Access within some of the sub-divisions is narrow and congested, with the potential to pose serious problems for fire crews responding to a fire and for evacuating residents and tourists.

All levels of government have come to recognize that wildfires are part of the surrounding forest ecosystem, and that wildfire is a significant threat to the communities.

In the Bow Corridor, homeowners, businesses, developers, and councils are working together with provincial and federal officials to reduce this risk. These initiatives vary from cleaning up directly around homes and creating fuel breaks near communities to much larger landscape projects taken to create large scale changes in fuel continuity.

Municipal councils and planners have reviewed a number of building materials and in many cases are limiting the use of wood shakes, siding, and other flammable materials in new construction. Developers are building better road systems into new communities, and are often completing fuel modification of the surrounding forest cover before construction starts.

Assessments have been conducted in existing subdivisions and plans have been drafted to create a number of fuel breaks and fuel modified areas. In some cases, homeowners are also taking action by replacing wood shake roofs with materials that are much more fire resistant.

Within Banff National Park on the western end of the Bow Corridor, the Warden Service has a vegetation management program that includes manual and mechanical fuel modification as well as prescribed burning to reduce fuel loading around Banff. This has been expanded, in consideration of the implications of a high-intensity wildfire from within the park threatening communities outside the park at the east end of the Bow Corridor.

Localized fuel modification projects, within and near communities alone, cannot reduce the threat of massive fire to communities. Working together, the Warden Service, provincial, and municipal agencies have started to create landscape level changes in the forest fuels within the Bow Corridor. The intent is to create breaks that will be effective in slowing a large-scale fire that could threaten communities.

A 7,500-hectare prescribed fire coupled with fuel modification on the Fairholme bench east of the park boundary will remove considerable fuel loads, as well as, having significant ecological benefits for wildlife and a renewal of the forest land base. The burn will create a mosaic on the forest landscape that will benefit wildlife, renew forest growth, and diversify vegetative cover. The new forest that emerges will be less prone to intensive crown fire and much more resistent to insect and disease.

A second project, led by Sustainable Resource Development with co-operation from Alberta Community Development and Banff National Park, uses natural features in the landscape coupled with fuel modification and reduction to create breaks that will act as anchor points in fire suppression. With additional fuel modification in the surrounding area, a second landscape level break in the continuous coniferous fuels will be created.

### Kamloops, British Columbia

The City of Kamloops is in south central British Columbia, and has a population of 80,000.
The City of Kamloops Fire Department and the British Columbia Ministry of Forests have expressed concern over increasing subdivision development in forested areas and the growing potential for loss of life and property from an interface fire.

The Kamloops Forest District of the British Columbia Forest Service formed a partnership with the City of Kamloops and landowners to minimize interface hazard in Kamloops. The partners have been working on interface fire issues since 1985 as a result of the "Kel" fire. Following that fire, initiatives focused on better communication between the B.C. Forest Service and Kamloops Fire Department, on the development of an incident command system,

public education, and fuel modification to protect high-risk subdivisions.

Vegetation throughout the city consists of moderate to dense stands of Ponderosa pine and interior Douglas-fir with a continuous surface cover of grass and coniferous needle buildup. Slopes throughout the city range from flat in the valley bottom to 45 percent in the hills. There are many steep, densely vegetated natural ravines in many of the hillside communities that would cause wildfires to burn intensely and spread rapidly uphill.

Development in Kamloops has many features that increase the chances of major losses to an interface fire including:

- Continuous and flammable vegetation adjacent to or overhanging buildings.
- Substantial numbers of buildings built with flammable materials.
- Narrow and winding access roads with grades exceeding 15 percent and cul-de-sacs with inadequate turnaround radius for large fire trucks.
- Buildings built on steep slopes with flammable decks overhanging flammable forest fuels.

The Kamloops Fire Department and B.C. Ministry of Forests fought an average of 175 potential interface fires annually from 1985 to 1989. The Kel fire in 1985, the Peterson Creek Park fire in 1988, and the Dome fire in 1991 all threatened homes in Kamloops and underscored the need for interface fire planning and fire prevention.

The City of Kamloops is the first community in British Columbia to adopt a fire policy for subdivision and vacant lot development within areas identified as high-risk interface areas. All new subdivisions within an urban/wildland interface area require an assessment of the geographical features, in consultation with the Ministry of Forests, to address the potential for urban/wildland hazards and to determine whether the proposed development plan is suitable.

As a condition of development approval, restrictive covenants must be registered to ensure that:

- Potential purchasers are aware of interface fire issues.
- All wooden shake and shingle roofing materials and installation meet the Class "B" fire rating requirements.
- The City is not liable in the event of damage to individual homes as a result of the spread of fire through urban/wildland interface areas.
- Fuel-reduced buffers of a minimum width of 10 metres must be maintained around each structure.
- All eaves, attics, decks, and openings under floors must be screened to prevent the accumulation of flammable material.
- All wood-burning appliances must be installed with approved spark arrestors.

In addition to legislative solutions, the B.C. Ministry of Forests and City of Kamloops have completed cooperative hazard assessments on Kamloops residential subdivisions and fuel modification projects within the city and on adjacent public land.

The Forest Service has completed several projects on public land using seasonal fire crews. Homeowners have also undertaken fuel modification projects. The B.C. Forest Service has completed fuel modification on public land adjacent to private land while private landowners have done fuel modification on their land. The City of Kamloops has performed fuel modification in forested areas within the city limits using funds from the city's fuel modification budget and City crews to complete the work. Four major fuel modification projects have been started, with annual work being completed in each of the areas.

In 1991, the Thompson/Okanagan Inter-Agency Interface Committee was formed to address the growing interface fire problem in Kamloops and in the Okanagan region of British Columbia. Members of the committee include B.C. Ministry of Forests, the B.C. Fire Commissioner's Office, municipal fire departments, regional districts, the RCMP, B.C. Hydro, and homeowners.

Two initiatives to date include the production of the *Wildland/Urban Interface Manual* and the *Wildland/Urban Interface Awareness Manual*.

The first manual is a detailed document dealing with agency roles and responsibilities, fuel management, subdivision approval, interface response teams, community involvement, communications and media, fire operations and incident command, and the development of a community management plan.

The second manual is a document designed to enable anyone to complete an Interface Public Awareness Program in their community. It includes fact sheets on hazard assessment, fuel modification, and designing a fire-safe subdivision. Public relations information covers working with the media and designing and giving public presentations. Public education materials include camera-ready artwork for communities to design their own pamphlets, and a copy of the *Fire Safe Inside... and Out* video.

Fire suppression personnel from the City of Kamloops and B.C. Forest Service agree that the risk of structure loss to wildfire in Kamloops has been reduced as a result of these projects. Greater public awareness of the interface fire issue is one of the major successes of the program.

Changes to city planning legislation have resulted in new subdivisions being developed in a FireSmart manner. Kamloops has experienced wildfire in communities that have completed fuel modification projects and all buildings were saved.

## Spokane, Washington

Spokane County is in eastern Washington State. The county has experienced a 25-percent increase in total population since 1970, represented by a six percent increase in urban population and a 62-percent increase in rural population. Spokane County has experienced several interface wildfires, including the 1987 Hangman Hills fire that destroyed 24 homes and the 1991 Spokane firestorm that resulted in the death of one person and the destruction of 108 homes.

Because of these devastating losses, several actions were taken to minimize the risk of losses to wildfire. One of the most important was the multi-program public awareness/education campaign entitled "Firestorm: Five Years After."

The Washington State Department of Natural Resources (DNR) is responsible for fire protection on state and private lands. Following the Hangman Hills fire in 1987, the department started several projects to combat the growing interface fire problem in Spokane County.

1. A review of the fire identified four problem areas: command, communications, media interaction, and traffic control. The county fire chiefs' association and the DNR established four committees to address the problems and recommend actions.
2. Fire officials conducted a disaster drill in 1990, involving 140 personnel from 14 fire districts and agencies. Later in the year, a wildfire threatened 10 homes in the residential development where the drill was held. Three fire districts and the DNR responded, holding the fire to 4 hectares and protecting all the homes.
3. The DNR prepared the *Wildfire Hits Home* video and public education campaign and used this information until 1991.
4. The DNR identified 12 high-risk interface areas in the state, including Spokane County, and prepared a booklet for residents on reducing the interface hazard around their homes.
5. Fire officials increased interagency cooperation by holding two wildfire conferences.
6. Fire officials in Spokane County recommended county restrictions on residential developments in forested areas, including a ban on wood shake roofs. County officials adopted none of these restrictions. Opponents argued that the 1987 Hangman Hills fire had been an isolated incident and would not happen again.

The 1991 firestorm, called "Firestorm '91," showed that much more work was needed to combat the growing interface fire problem in Spokane County. This devastating fire resulted in many actions being taken:

- The Washington State Fire Service Mobilization Act established formal mutual aid agreements, incident command organization, and fiscal responsibility for mutual aid of fire suppression resources among fire agencies.
- Spokane County government has new, tougher building codes for new developments including wider access roads, screens over vents and chimneys, and a ban on wood shake roofs.
- Interagency cooperation improved between wildfire and structural firefighting agencies

PHOTO: RICK ARTHUR

and cross-training and equipment improvements were instituted.

- Washington State DNR and local fire districts began door-to-door interface fire risk assessments with landowners in hazardous areas.
- During the 1996 fire season, the Washington Department of Natural Resources initiated a multi-program public awareness/education campaign in the Spokane area. The "Firestorm: Five Years After" campaign was undertaken to inspire landowners to carry out a series of actions to improve their properties' fire risk.

### Wildfire prevention campaign

Paid television advertising, radio and television public service announcements, home-show booths, newspaper and television news stories, business mailings by corporate sponsors, and a half-hour news special on KXLY television were all used to promote *Wildfire Safety* kits. It is estimated that the campaign reached 700,000 residents in eastern Washington with three percent of them requesting the kit. (A 1-percent response is the normal goal of television marketers.) *The Wildfire Safety Kit* included information about interface fire safety, power line safety, outdoor burning regulations, and a reply card for landowners to return to Washington DNR documenting their participation in the Backyard Forest Stewardship program.

Landowners who completed six or more activities received a Backyard Forest Steward decal and a certificate.

Corporate sponsors of the program included Washington State DNR, Inland Empire Fire Chiefs Association, Inland Power & Light Company, Mutual of Enumclaw Insurance Company, and Washington Water Power. An added benefit of the program was the strong relationships that were established among the campaign partners.

In the future, the Washington State DNR would like to place more emphasis on community planning and development issues and fuel modification programs. The Washington State Department of

Natural Resources believes that there are no "magical" solutions to solving the interface fire problem. The best approach is a long-term plan of public education and awareness for landowners, land developers, elected officials, and fire officials.

This has proven to be successful in the 1996 Bowie Road fire where, even though eight homes were destroyed, another six were saved because of the use of FireSmart construction materials and fuel modification by the homeowners.

Many landowners have told the DNR, through the Backyard Forest Stewardship program, that they have completed the required modifications to their property to make it more fire-safe. There are still many opponents to the changes proposed to legislation in Washington State, and DNR and fire officials are considering another public education campaign to keep the issue fresh in everyone's mind.

### Boulder County, Colorado

Boulder County is located in southeast Colorado, northeast of Denver. There are 18,000 people living in 6,000 homes in the forested rural mountain setting of Boulder County. On July 9, 1989, a carelessly discarded cigarette started a wildfire. The Black Tiger fire burned up a steep forested slope of residential homes nestled amongst the trees. Within the first six hours, 44 homes were destroyed and 850 hectares of land was burned.

The value of lost homes and natural resources was estimated at $10 million, with an additional $1 million spent to control the fire. More than 500 firefighters from local, state, and federal agencies worked to control the fire and protect homes in its path.

The Black Tiger fire and loss of homes was the result of a combination of many factors common to interface fires:

- Lack of rain
- A prolonged heat spell
- High winds
- Steep slopes
- Buildup of forest fuels from modern fire suppression
- Use of combustible construction materials
- Poor site access for emergency vehicles
- Lack of fuel modified area between homes and forest fuels

◄ *The Wildfire Safety kit included information about interface fire safety, power line safety, and outdoor burning regulations*

PUBLICATIONS: WASHINGTON DEPARTMENT OF NATURAL RESOURCES

► *The Black Tiger fire was the worst wildland fire loss in Colorado's history, but the conditions that led to this fire exist in many counties across the state of Colorado.*



PHOTO: NFPA

The Black Tiger fire was the worst wildland fire loss in Colorado's history, but the conditions that led to this fire exist in many counties across the state of Colorado.

The Black Tiger Fire Case Study made 23 recommendations in an effort to minimize future catastrophic losses to wildfire in Boulder County. Several of the recommendations dealt with the need to determine the wildfire danger potential in areas where residential buildings will be built.

As a result, Boulder County developed the Wildfire Hazard Identification and Mitigation System (WHIMS) for identifying and mitigating the wildfire dangers in the wildland/urban interface. WHIMS was initiated in 1992 for the county's wildland/urban interface along the front range of the Rocky Mountains, covering more than 110,000 hectares from the City of Boulder to the west county line.

The system combines expertise in hazard assessment, forest management, wildfire behavior, and fire suppression and uses computer analysis and mapping technology. The fire district and community residents are also involved. WHIMS is designed for wildfire danger identification, homeowner education and motivation, wildfire pre-attack planning, emergency response, land use planning, land management, risk assessment, and disaster assessment.

Data about land characteristics and land ownership and buildings are provided by local government agencies. Local volunteer firefighters from the fire district, in cooperation with the landowner, complete hazard surveys of residential lots. The local fire department supplies access and water source information.

Using the computer-based system, land ownership and structure data is correlated to the physical land data (slope, aspect, fuel type), the hazard survey of individual residential lots, and information on access and water supply within the community. Data is compiled and analyzed to produce two hazard rating maps, one of the existing hazard, one a projection of hazard after several proposed mitigative factors are completed in the community.

One of the major benefits of WHIMS is the direct contact, participation, and educational experience the landowners and volunteer firefighters received in completing the hazard surveys. Landowners are educated on interface fire dangers,

while firefighters gain first-hand knowledge of hazards within a particular area to use during suppression of future wildfires.

Information generated from WHIMS is put into the hands of those who will use it. A map book is given to the fire district and other responding agencies showing land parcels, physical features, hazard surveys, water and access information, and the "before" and "after" hazard ratings. Information is presented to the community for discussion on hazard mitigation, to county land use planners for use in development planning and reviews, and to fire districts for wildfire pre-attack planning.

The goal of the program is to complete WHIMS in each of the fire protection districts in the mountainous areas of Boulder County, including the urban fringes of the City of Boulder. A study completed one year after the first WHIMS area was completed showed that 22 percent of 377 homes had completed interface mitigation ranging from pruning of branches to re-roofing the house. Recently a joint fuel modified area plan was created for 42 homes within the first WHIMS area.

The most important accomplishments of WHIMS include:

- Encouraging local fire department volunteers to buy into the program, and creating a direct interaction between firefighters and homeowners — resulting in increased awareness for both parties.
- Encouraging homeowners to take responsibility for reducing wildfire dangers around their homes by identifying the hazards and determining the mitigation methods best suited to the hazard.
- Providing alternatives for new developments in hazard areas.

### Victoria, Australia

Victoria is one of the most bushfire-prone areas anywhere and the risks are increasing as the city of Melbourne spreads into surrounding bushland. Since 1939, Victoria has had 14 major interface fire events resulting in the loss of 211 lives and more than 4500 buildings. During the "Ash Wednesday" fires of February 16, 1983, 47 human lives and more than 27,000 head of stock were lost, and more than 2000 homes were destroyed.

Following serious fires across Victoria in 1939 and 1944, a Royal Commission recommended a single firefighting agency for rural Victoria. On April 2, 1945, the Country Fire Authority began and has developed into one of the world's largest volunteer-based emergency services.

The responsibility of fire prevention and suppression within rural Victoria lies with the Country Fire Authority (CFA). There are currently 1219 community-based CFA brigades consisting of 70,000 volunteers serving areas throughout regional Victoria and outer metropolitan Melbourne. There are 2.5 million people in the CFA's area. Funding for the agency comes from fire insurance premiums (77.5 percent) and the state government (22.5 percent).

While the CFA still maintains its high level of firefighting capabilities, it is putting stronger emphasis on helping the community to eliminate and reduce risks by encouraging community members to take responsibility for their own safety, and by helping the community to minimize risks. In partnership with schools, the CFA is helping children learn about fire safety in the home and how to survive bush fires. Thousands of children each year are reached by satellite television, CFA's mobile education unit, and by visits from local brigades.

Community Fireguard is a CFA community education and empowerment program designed to reduce loss of life and property in wildfires. It is about small groups of people living in high fire-risk areas taking responsibility for their own fire safety. Residents learn about their wildfire problem and work together to develop survival strategies that suit their situation. Community Fireguard groups are



COUNTRY FIRE AUTHORITY
VICTORIA

supported by CFA staff and volunteers trained to facilitate the learning and strategy development process.

Since the program began in 1993, more than 400 neighborhood groups have formed throughout the wildland/urban interface of Melbourne and regional cities. Community Fireguard groups, in cooperation with the CFA and Department of Natural Resources and Environment, have completed fuel modification projects, wildfire suppression training sessions, fire behavior training, and wildfire survival techniques. Based on this training, residents were helped to develop strategies that they could understand and believe in.

## Many Hands Make Light Work

One of more than 20 Community Fireguard groups that formed in response to these fires is the Holy Hill Group, whose street was on the perimeter of the Ferny Creek fire. This group contributed the following article to the state-wide Community Fireguard newsletter as a good example of interagency cooperation and residents willing to help themselves.

"Our Community Fireguard Group was established shortly after the 21 January fire in Ferny Creek. One of our greatest concerns was the fire risk posed by thick dry undergrowth in the National Park just below our properties.

"Our CFA facilitator suggested we contact the Department of Natural Resources and Environment (NRE) and arrange a meeting on-site to discuss what could be done. At this meeting it was agreed that NRE would burn impenetrable blackberries along the old fence line and remove the fence, allowing access into the forest for gradual removal of the fuel and weeds opposite our properties.

"Within the next few days, NRE had lived up to their part of the bargain. Our local Park Ranger attended our next Fireguard meeting where we decided to work with Parks Victoria to clean up the area. He has participated in each working bee since, giving us lots of information about plant identification and fire behavior. Working as a "Friends" group of the National Park means that we are covered by their insurance.

"After talking to our local CFA Captain about our project, we were delighted when he sent along a tanker, and crew of five armed with rake hoes, to our next working bee. They worked with us for two hours and kept an eye on our bonfires. We made great progress that day as other residents, including non-locals, also turned up to help.

"The project hasn't taken much time or organization but it has significantly reduced the fire danger in our area. On average, we work approximately two hours every third weekend. "With the blackberries and other rubbish gone, the area looks much nicer and people get really enthusiastic about the next working bee. It is also a great opportunity for neighbors to get together and have a bit of a chin wag which otherwise doesn't seem to happen much these days."

The Community Fireguard program has proven an effective method of reducing community vulnerability, leading to increased preparedness and the development of self-reliant survival strategies by interface residents.

# RESOURCES
# &
# APPENDICES

# RESOURCES

For more information about interface fires, call or visit your local wildland fire control office or municipal office, or consider using some of the resources listed below.

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## Websites

Refer to the Partners in Protection web page for the latest links to on-line resources. www.partnersinprotection.ab.ca

# Appendix 1
# Conversion Table

## Metric Conversion Table

| | US | Metric | Imperial |
|---|---|---|---|
| **Volume** | 1 gallon | 3.785 litres | .833 gallon |
| | 1.201 gallons | 4.546 litres | 1 gallon |
| | .264 gallon | 1 litre | .219 gallon |
| **Weight** | 1 pound | .4536 kilograms | 1 pound |
| | 2.2046 pounds | 1 kilogram | 2.2046 pounds |
| **Linear Measure** | 1 mile | 1.609 kilometres (km) | 1 mile |
| | .621 miles | 1 kilometre (km) | .621 miles |
| | 1 yard | .9144 metres (m) | 1 yard |
| | 1.094 yards | 1 metre (m) | 1.094 yards |
| | 1 foot | .3048 metres (m) | 1 foot |
| | 3.28 feet | 1 metre (m) | 3.28 feet |
| | 1 inch | 2.54 centimetres (cm) | 1 inch |
| | .393 inches | 1 centimetres (cm) | .393 inches |
| | 1 inch | 25.4 millimetres (mm) | 1 inch |
| **Pressure** | 1 pound per square inch (psi) | 6.9 kilopascals (kPa) | 1 pound per square inch (psi) |
| | .145 pounds per square inch (psi) | 1 kilopascal (kPa) | .145 pounds per square inch (psi) |
| **Area** | 1 acre | .4048 hectares (ha) | 1 acre |
| | 2.47 acres | 1 hectare (ha) | 2.47 acres |

**Temperature**    1 Fahrenheit degree is smaller than a Celsius degree - 1 Fahrenheit degree is 5/9 of a Celsius degree.

To convert Fahrenheit degrees into Celsius: Subtract 32, multiply by 5 and divide by 9.

To convert Celsius degrees into Fahrenheit: Multiply by 9, divide by 5 and add 32.

Freezing point of water 0 deg C = 32 deg F - Boiling point of water 100 deg C = 212 deg F.

# APPENDIX 2
# FUEL REDUCTION STANDARDS FOR CROWN FIRE HAZARD

A standard for fuel reduction that exceeds the standards prescribed in the globally recognized fire protection standard: NFPA 1144 — 'Standard for Protection of Life and Property from Wildfire' was developed for dense coniferous forests in the Rocky Mountains ('Fuel Reduction Plan for Banff Townsite and Surrounding Area,' Arbor Wildland Management Services, 1991). It offers an alternative fuel reduction standard for use in interface areas with a substantive and established crown fire danger.

This standard includes fuel reduction standards selected after a review of numerous fuel modification standards unique to the steep terrain and predominantly coniferous fuels of the of the Rocky Mountains, Eastern Slopes. Recommended minimum standards (such as post thinning stem counts or fuel modification zone widths) provide a higher level of fire protection than does any other currently accepted standard. There are a variety of reasons for this.

- Target areas contain high-value facilities with high levels of public use. Risk management protocol merits increased facility fire protection measures.
- Developments or facilities often have structure densities that exceed the single structure densities that most fuel management standards address.
- Facility structures often exhibit high flammability levels due to building design and materials.

Models of crowning potential suggest that crown fire will have difficulty developing or carrying into areas where these fuel management guidelines have been met.

## *Management of fuels to reduce crown fire danger— fuel modification zone widths*

The principal intent of many of the fuel management standards proposed in the Arbor report is essentially to mitigate the development and/or negative impacts of crown fire on values at risk.

The following considerations led to recommendations for increased fuel modification zone widths:

- Large tracts of continuous forest fuels found adjacent to many interface areas increase the likelihood of crown fire development and subsequent impacts on values at risk.
- Frequent spotting is possible up to 200 metres in advance of a crown fire (some embers drop as far as 2 kilometres ahead of the fire). Increased zone width ensures that the area of the heaviest spotting is contained in a fuel modification zone.
- On a 70-percent slope, radiant heat from a crown fire can be so intense that the distance from fire front to control line is recommended to be 60 metres in order to minimize skin scorches on fire fighters. Since a strong wind has a similar effect to slope, it was felt that a width of 100 metres is a reasonable minimum distance for most situations where strong winds can be anticipated.
- The flame length of a burning mature lodgepole stand can reach a height of approximately 100 metres. With a strong upslope wind, the hot gasses could be driven almost parallel upslope which would affect high structures within a range of some 150 metres. Therefore, a width of 200 metres is recommended on steep slopes.
- Interface community access routes typically cut through extensive tracts of continuous forest fuels. Public safety is threatened if fire cuts off a single access route—100 metre wide fuel modification zones are recommended for both sides of an access route.
- Recommended thinning patterns may not be uniform throughout the width of the work

unit. Variations are encouraged for aesthetic reasons and to minimize wind damage. This requires a corresponding increase in fuel modification zone width.

In consideration of the uniqueness of the interface fire problem in areas where a high level of crown fire danger is assessed to exist, Partners in Protection concurs with the increased standard of fire protection proposed by the Arbor report. It is reasonable and appropriate.

Partners in Protection also recommends that the fuel management recommendations of local fire control personnel be utilized in non-typical or special situations.

## Fuel Reduction Standards for Crown Fire Hazard

This standard recommends a general width of 100 metres for firebreaks. In situations where slopes and the possibility of adverse winds prevail, and high values at risk are present, a width of at least 200 metres is recommended.

### Thinning Standards (Spacing of trees)

Thinning is recommended to reduce the density of a forest stand (create a space between the tree crowns) so that the flames will not spread from crown to crown. The spacing of trees for crown fire danger reduction is given in crown diameters. Assuming an average crown diameter of 2 metres, the three basic thinning standards are:

**Density C = one crown width**
   (4 m between stems)

**Density B = two crown widths**
   (6 m between stems)

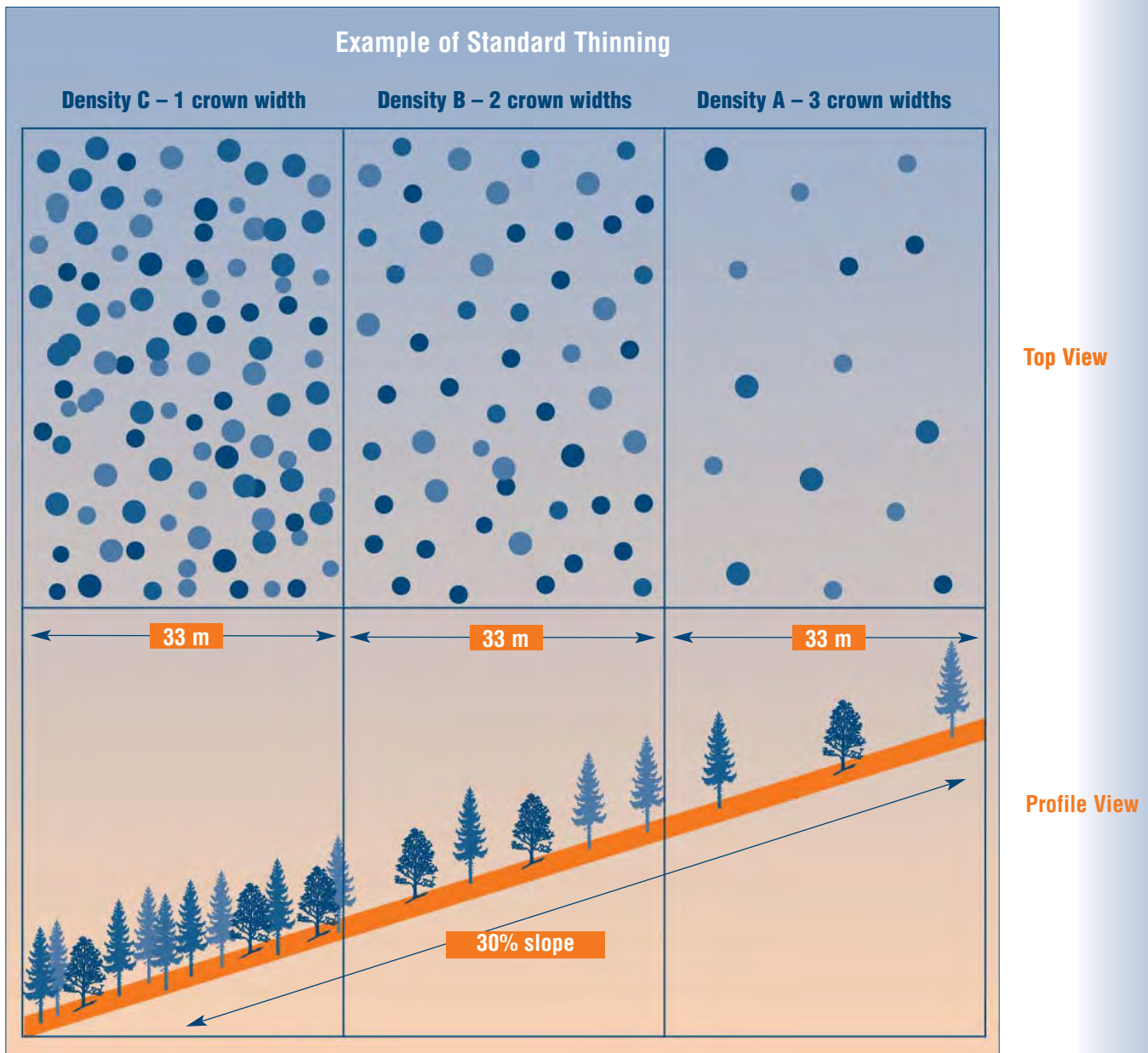**Density A = three crown widths**
   (8 m between stems)

Thus, in a typical, fully stocked logepole pine stand every second tree is removed to attain density "C", density "B" is attained by removing two stems and leaving the third and density "A" means that three trees are removed and the fourth one left standing.

- Standard "A" is to be used on slopes immediately adjacent to buildings or heavily traveled roads on the downhill side of the value at risk.
- Standards "B" and "C" are used at a distance of approximately three tree lengths from the



▶ *Firebreak in Banff National Park showing cluster thinning.*

PHOTO: KELVIN HIRSCH

## Example of Standard Thinning

| Density C – 1 crown width | Density B – 2 crown widths | Density A – 3 crown widths |



**Top View**

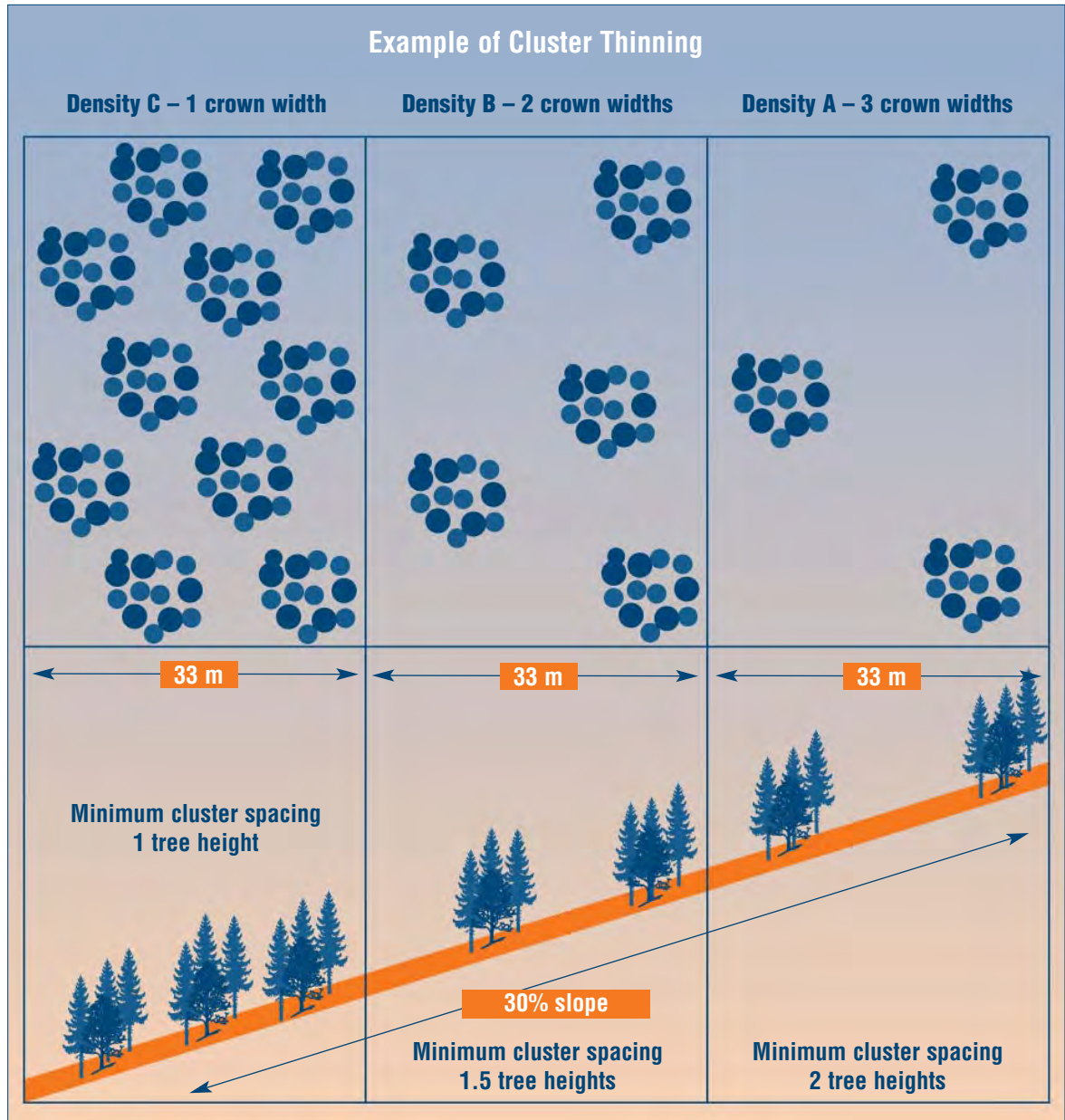33 m | 33 m | 33 m

**Profile View**

30% slope

protected objects or adjacent to the protected object on sites with lesser slope.

- Increasing slopes require increased treatment distances to be effective. This fuel management standard incorporates slope/treatment distance recommendations as cited by the National Wildfire Coordinating Group (NWCG).

The illustration above provides top and profile views of standard thinning using all three spacing levels across a 100-metre expanse of 30-percent slope below values at risk.

### Thinning Standards and Windfirmness

An effort must be made to leave the most windfirm trees. Such trees include spruces, which occur in the pine stands either as smaller suppressed trees or as isolated trees or clumps in open areas or wet spots, Douglas fir, young healthy pines, individual trees in open areas or as wind-resistant clusters of trees. It is important to pattern the spaces around the "leave" trees to favour windfirmness. Trees assessed as unstable, diseased or damaged should be removed even if it changes the spacing pattern.

## Example of Cluster Thinning

| Density C – 1 crown width | Density B – 2 crown widths | Density A – 3 crown widths |

**Top View**

**Profile View**

33 m

33 m

33 m

Minimum cluster spacing
1 tree height

30% slope

Minimum cluster spacing
1.5 tree heights

Minimum cluster spacing
2 tree heights

### Cluster Thinning

The illustration above provides top and profile views of fuel reduction using all three cluster thinning standards across a 100-metre expanse of 30-percent slope below values at risk.

The table on page 8 summarizes the approximate number of stems left on site after thinning to any of the three thinning standards applied to stands with different average crown diameters. Only the lightest thinning standards for the two narrowest crowns left stand densities above the spacing required to prevent crown fire development or spread. This suggests that an alternative approach in very dense stands is to thin fuels to clusters or small groves.

Thus, in stands of trees with very narrow crowns, or trees forming a wind resistant group, residual trees can be left standing in clusters. In such cases the diameter of the cluster, which should not exceed 10 metres, is to be considered as the crown diameter and the spaces between them must reflect the cluster diameter. Clusters should have ladder and surface fuels removed.

## THINNING REGIMES

Approximate number of tree stems per ha related to crown diameter and proposed thinning regime.

| Crown diameter (m) | Density C – 1 crown width | | Density B – 2 crown widths | | Density A – 3 crown widths | |
| --- | --- | --- | --- | --- | --- | --- |
| | Distance between stems (m) | Stems per ha | Distance between stems (m) | Stems per ha | Distance between stems (m) | Stems per ha |
| 1 | 2 | 2500 | 3 | 1100 | 4 | 625 |
| 1.5 | 3 | 1100 | 4.5 | 500 | 6 | 280 |
| 2 | 4 | 625 | 6 | 280 | 8 | 160 |
| 2.5 | 5 | 400 | 7.5 | 175 | 10 | 100 |
| 3 | 6 | 280 | 9 | 125 | 12 | 70 |
| 3.5 | 7 | 200 | 10.5 | 90 | 14 | 50 |
| 5 | 10 | 100 | 15 | 45 | 20 | 25 |
| 7.5 | 15 | 45 | 22.5 | 20 | 30 | 10 |
| 10 | 20 | 25 | 30 | 10 | 40 | 6 |

NOTE:  Distances for "crown diameters" over 3 metres are intended as guidelines for clusters of trees.

# APPENDIX 3
# SAMPLE COMMUNICATIONS DOCUMENTS

*Good communications and public education are essential to developing FireSmart  communities. This appendix provides sample fact sheets and a poster that could be used in public education in the wildland/urban interface.*

*Partners in Protection encourages agencies and organizations to copy these materials and make them available to the public.*

# Wildfire
## A Disaster Waiting to Happen!

### Living with Fire

Whether near large urban areas or in remote rural locations, every year more and more people are retreating to peaceful surroundings and building their homes in the "wildland/urban interface" (areas where the community meets grassland or trees). Living in these areas means living with fire.

Fire isn't always bad — it's nature's way of recycling and rebuilding, but in high value areas, like the wildland/urban interface, wildfires are not desirable. Effective fire prevention messages, as well as the development of modern firefighting equipment and techniques, have led to strict controls that shut fire out of many forest and grassland areas. Most governments have implemented forest management programs to help combat the problem, but the fact remains that forests are becoming older, more closed in, and loaded with fuels (vegetation). If a fire ignites in an area with lots of fuel when the weather conditions are hot, dry, and windy, it can be extremely intense and difficult to control.

To tackle wildfire issues, seven disciplines have been designed to make forest or acreage living safer for homeowners. The disciplines are:

✔ Education - educating people living in forest or grassland areas about precautions they can take.

✔ Fuels Management - keeping the home safe by thinning, pruning, and removing trees, branches, and deadfall that can fuel a fire.

✔ Legislation - involving development (e.g. homes in forested areas should be required to have a sprinkler system).

✔ Development - guidelines can be set up by builders and developers to make developments fire smart.

✔ Planning - implementing restrictions or guidelines (e.g. roads and driveways should be wide enough to support a fire truck).

✔ Training - cross-training firefighters who tackle forest fires and extinguish house fires.

✔ Inter-agency cooperation - municipal volunteer fire departments working together with forest firefighting resources.

### The Problem

Wildfire is one of the most powerful forces in nature. Many residents in Canada have lost their homes to wildfire. Many have also been injured or evacuated from their homes and communities when fire has threatened their safety. Fortunately, the number of losses related to wildfire incidents in Canada is small in comparison to floods or other disasters. This can be attributed to good fortune and the fact that most wildfires have occurred in low or non-populated areas. Unfortunately these statistics can change at the strike of a match. It's only a matter of time before a number a tragic wildfires plague Canada.

### The Solution

While the fury of a wildfire may be frightening, it's a reality that every community must deal with. Wildfire is a community problem that needs a community solution. It will take the efforts of political leaders, community planners, and members of the public and private sector to solve wildfire issues.

During a wildfire there may not be as many firefighters as there are homes in need of protection. While firefighters defend one home, the fire's perimeter may rage on, threatening many more structures and burning acres of vegetation. Residents cannot solely rely on firefighters to save their property. There are three priorities of fire suppression — life, property, and the environment. Life will always be the number 1 priority but the priority firefighters place on property and the environment will depend on whether the fire is threatening a natural resource that is vital to the economic stability of the area.

Everyone in the community must take individual responsibility to prepare and protect their home, business, family, and the community from the risk of a wildfire. By doing this, we will give firefighters the help they need to do their job when a wildfire incident occurs. Check with your local fire agency and take steps to find out how you can help prevent or lessen the effects of a wildfire. We can't always prevent or stop wildfire, but we can be prepared for the day this uninvited guest pays a visit to our backyard!

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# Wildfire
## Be Prepared!

## Have A Plan — Know What to do Before and During a Wildfire Incident

### Plan ahead

A major wildfire in your neighborhood will have a great impact on your activities and you may find yourself without modern conveniences. You can lessen the impact by planning ahead.

When you can check each of the boxes below, your property will be FireSmart and you will be prepared for an interface fire.

❏ Store at least a three-day supply of drinking water and food that does not require refrigeration or cooking.

❏ Store a portable battery- or solar-powered radio, flashlight, emergency cooking equipment, portable lanterns, and batteries.

❏ Consider purchasing a portable generator to supply power for lights, and for heating and cooking.

❏ Maintain first-aid supplies to treat the injured until help arrives.

❏ Have an escape plan so that all members of the family know how to get out of the house quickly and safely.

❏ Have a contingency plan so family members can contact each other in case they are separated during an evacuation.

❏ Make sure all family members are familiar with STOP, DROP, AND ROLL, if their clothes should catch on fire.

### If fire is approaching your home

If you see a fire approaching your home, report it immediately by dialing 9-1-1 or your local emergency number. If it is safe, and there is time before the fire arrives, you should take the following action:

- Close all windows and doors in the house.
- Place pre-cut plywood covers over the vents, windows, and other openings of the house.
- Park your car, unlocked, with the keys in the ignition and positioned forward out of the driveway. Keep car windows closed and have your valuables already packed in your car.
- Turn off propane or natural gas.
- Turn on the lights in the house, porch, garage and yard.
- Inside the house, move combustible materials such as light curtains and furniture away from the windows.
- Place a ladder to the roof in the front of the house.
- Put lawn sprinklers on the roof of the house and turn on the water.
- Move all combustibles away from the house including firewood, lawn furniture, etc.
- Evacuate your family and pets to a safe location.
- Stay tuned to your local radio station for up-to-date information on the fire and possible road closures.

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# Wildfire
## Check It Out!

### Check - To See if Your Home and Landscape is FireSmart

#### 1. Protect the roof over your head

The roof is the most vulnerable component of your home. Untreated wooden shake roofs are the number 1 cause of structure losses during wildfires. A wildfire produces flaming debris that travels in the air in advance of the fire. Embers landing on a combustible roof can start the roof on fire, spreading quickly to the rest of the house.

❏ Your roof is made from fire-resistant materials such as metal, slate, tile, or asphalt shingles.

❏ All overhanging branches, needles, and other debris have been cleared from your roof and gutters.

#### 2. Create a FireSmart landscape

**Maintain Priority Zones -**
**10 metres around your home**
A priority zone is an area that will help keep flames away from your home and provide firefighters with access around your home. If you can, create a FireSmart landscape at least 10 metres around your house to reduce the chance of a wildfire spreading onto your property and burning through to your home.

❏ Flammable vegetation within 10 metres of your home has been removed or converted to fire resistant plants (e.g. broad-leaf deciduous trees, low shrubs, ferns, annuals, etc.).

❏ The plants in your yard have been spaced three metres apart.

❏ Dead leaves, dry brush, twigs, and needles have been removed from your roof and from around your home.

**Break the chain of fuel -**
**10 to 30 metres around your home**
Fire needs fuel to burn. You can sap its strength by breaking the path of continuous vegetation that can carry flames from your landscape to your house. Low tree branches allow fire to spread from the ground into the treetops.

❏ Trees have been removed or thinned to reduce the chance of fire spreading from tree to tree.

❏ Trees have been pruned at least two metres from the ground.

❏ Stacks of wood and piles of debris have been removed from around your home.

#### 3. Make a FireSmart exterior

During a wildfire windows may break and allow the fire to travel into your home. Although pane windows reduce the probability of fire spreading, the most effective fire protection is achieved by covering vents, windows, and other openings (e.g., attic vents) with solid plywood shutters if fire is approaching. A home with non-combustible siding is resistant to fire. Overhanging decks and balconies will trap heat under the deck igniting the deck and siding. Materials stored under the deck add to the problem. Many homes use propane for heating. If exposed to fire, propane tanks may explode with disastrous consequences.

❏ The exterior finish on your home is made from non-combustible materials such as stucco, metal, brick, or cement.

❏ You have pre-cut solid plywood shutters to fit over vents, windows, and other openings, and have them stored in an accessible location.

❏ Your deck is built with non-flammable sheathing and has heavy support timbers.

❏ All debris has been removed from under your deck.

❏ Your propane and natural gas tanks are located at least 10 metres from buildings and vegetation has been cleared within three metres of the tank(s).

**Manufactured homes**
Manufactured homes should be skirted with a non-combustible material to prevent flammable material and embers from blowing under the home.

❏ The skirting on your manufactured home has a non-combustible material finish such as stucco, metal, brick, or cement.

PARTNERS IN PROTECTION

**Fact Sheet**

### 4. Firewood and waste burning

Careless burning indoors and out has been the cause of many wildfires. Burning wood in your fireplace can start a wildfire if sparks ignite your roof. If you must burn, do it safely.

❏ You have removed all vegetation within three metres of your chimney.

❏ An approved spark arrestor has been installed on your chimney.

❏ Your fire pit is located away from your structures and flammable vegetation.

❏ When burning in your barrel, you have ensured that:

❏ Your barrel is in good condition

❏ The ground is free of debris three metres around the barrel

❏ You have steel rods or pipes holding the burning material up from the bottom of the barrel

❏ A mesh screen (with openings no larger than 7 millimetres) has been placed on top of the barrel

❏ Firefighting tools (shovel, rake, water buckets, garden hose) are close at hand

❏ After burning, you have placed the ashes in a metal container, soaked them with water and let them sit for two or three days before disposing of them into a pit

### 5. Human-caused ignitions are no accident

Lightning ignites some wildfires but many are caused from human negligence. Check to see if you know why wildfires are started year after year.

- Homeowners using unsafe incinerators or fire pits.
- Farmers and acreage owners burning off landscape in hot, dry, windy conditions.
- Children playing with matches.
- Children or adults playing with fireworks.
- Motorists or outdoor enthusiasts throwing a burning cigarette or match into dry vegetation.
- Campers disregarding camp fire regulations.
- Heavy equipment being operated without a spark arrestor installed on the exhaust.
- Railroads (e.g., brake sparks, engine exhaust sparks).
- Blasting operations.
- Electric fences.
- Downed power lines.
- Vehicle fires.
- Burning and landfill sites that border grassland or treed areas.

A Structure and Site Hazard Assessment Form is available through your local fire agency that will help you evaluate the threat that wildfire poses to your house and landscape before or after development. As you go through the form you will better understand the steps you can take to mitigate the problem.

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# Wildfire
## Not in Our Back Yard!

**BE PREPARED!**

**WILDFIRE** is a risk in our community. Share in the solution and take responsibility to make your home part of a fire smart community. *Join us and see if you can find the 10 steps this family took to protect their home from* **WILDFIRE**.

BEFORE

Wood

1210
Smart way

AFTER

### Answers
1. *Replaced wooden shake roof with a metal roof.*
2. *Managed vegetation within 30 metres of the house.*
3. *Pruned trees 2 metres from the ground.*
4. *Cleared fallen leaves from the roof and within 10 metres of the house.*
5. *Relocated firewood 30 metres from the house.*
6. *Installed a spark arrestor on the chimney.*
7. *Widened the driveway to accommodate fire vehicles (5 metres).*
8. *Located a water supply.*
9. *Installed visible signage.*
10. *Requested fire personnel to do a hazard assessment.*

**Contact your local fire agency for more information on how to make your home FireSmart inside and out.**

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*Working Together for Safer Communities in the Wildland / Urban Interface*

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