City of Surrey

Parks, Recreation and Culture Department

Natural Areas: Fire Management Strategy

Shawn Gurney
Technician, Park Urban Forestry and Environmental Services

Blackwell Consulting Ltd.

Edited by: Diana Wegner
Professional Writer

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Introduction

Fire Management in Urban/wildland Interface Areas

In many areas of Surrey, wildland and natural areas containing flammable vegetation- trees, brush and grasses- exist in close proximity to rural and urban areas containing structures where people live, work and play. The zone where these areas meet is the 'interface', and a fire occurring there is called an interface fire.

Surrey's topography and climate make it particularly susceptible to wildifire in its natural areas. As the City continues to urbanize there is a greater chance there will be human-caused fires and that they will threaten citizens. In British Columbia it has been well documented that a significant percentage of wildland fires result from human activities, with an increasing number of these human caused fires occurring within the interface. Fires within this interface can result in significant economic loss and are often more difficult to control than wildland fires.

Of the City's park land approximately 60% is natural wildland with many natural areas adjacent to important structures that are at risk should a natural area fire occur. Given the significance of interface fires and their potential destructiveness, it is important that the associated risks be adequately managed. In February, 2001 the Office of the Auditor General of British Columbia submitted a report to the Provincial Legislative Assembly, Report 1: Managing Interface Fire Risks and concluded "that governments in British Columbia need to do more to be better prepared for major interface fires" (page 5 of the Report). The City has recognized a need to deal with this fire risk through the development of a formal *Natural Areas Fire Management Strategy* that outlines responsibility and recommends action in the areas of fire hazard and risk assessment, prevention, detection, suppression, rehabilitation and mitigation in park natural areas.

Purpose and Scope

This Strategy was undertaken to identify the fire management responsibilities of the Surrey Parks, Recreation and Culture Department (Parks) and set the fire management direction for the purposes of protecting, maintaining and enhancing Surrey's natural areas. The Strategy outlines management principles, goals and objectives and a fire management program designed to minimize the hazard and risk of uncontrolled natural and human caused fires in Surrey's natural areas.

The initiative to formalize a *Natural Areas Fire Management Strategy* originated with the adoption of the Parks, Recreation and Culture Commission's Urban Forest Parks Policy. Following the adoption of this policy, the Sunnyside Acres Urban Forest Advisory Committee initiated the development of a specific fire plan for Sunnyside Acres Urban Forest. Surrey's Parks Division staff decided to expand the scope of the plan beyond only forested lands to include all natural areas (ie. grasslands) on a citywide basis. This Strategy

applies to all publicly owned, natural area lands within the limits of the City of Surrey under the management of the Parks, Recreation and Culture Department.

Fire Environment

The City of Surrey lies within two biogeoclimatic zones, Coastal Douglas-fir and Coastal Western Hemlock, and the natural fire regime within these zones is described by long return interval crown fires and severe surface fires in combination (100- to 300-year return intervals). However, with the advent of modern fire suppression the fire regime has been significantly lengthened. This means that natural fires within this region typically occur during periods of unusual drought and/or rare weather events that are not part of usual weather patterns.

Logging history combined with long-term fire suppression has substantially altered natural succession within many of the natural areas of Surrey. Fuel accumulation and introduced alien plant species have all contributed to changes in the forest fuel complex. These historical activities have greatly altered the natural area composition and, in turn, altered the natural fire regime of the area. Combined with a growing population and increasing risk of human ignition there is a growing awareness that fire management is required. In the absence of fire management there is a high probability that the fire risk will increase in many of the City's natural areas.

Over the past twenty years there have been no recorded large-scale fires within Surrey's park natural areas. However, a number of intentional and accidental fire starts have occurred over the same period and could have resulted in large-scale fires within the interface. Of greatest concern is the large percentage of fires which are deliberately set in close proximity to facilities and structures adjacent to or within natural areas. These types of fire pose the greatest risk to property and public safety and are considered the most difficult to control.

Current Situation

As the land manager, Parks is responsible for all fire related inventory, mapping, hazard and risk assessments, prevention, detection, and rehabilitation and mitigation following fires in natural area parkland. At this time, Parks does not conduct any fire management programs or activities. Parks assists with initial suppression and provides consultation during Fire Department suppression activities.

Fire suppression in natural areas is the general responsibility of the City of Surrey Fire Department (Fire), with the Provincial Ministry of Forests providing aid. These responsibilities include initial attack, suppression, and mop-up of all fires.

In 1999 the Ministry of Forests, Provincial Forest Protection Branch, developed Operating Guideline #2.17.13, Fire Suppression Wildland/Urban Interface (see Appendix A) that outlines provincial and local government's roles in the suppression of wildland fires. The Operating Guideline identifies the key element between the Ministry and local fire department as one of 'mutual aid'. In the recent past the local governments could rely heavily on the Forest Service to provide the necessary expertise and equipment to extinguish

a fire within a forested park. Local governments are now expected to be more self reliant for fighting fires within the City's forested parks.

At the present time, little sharing of natural area fire related information or planning occurs on a consistent basis between Fire and Parks.

In other parts of the Lower Mainland there is evidence that the standard of care practiced by local governments, in the field of natural area fire management, is rising. The Greater Vancouver Regional District, the City of Vancouver and the District of North Vancouver have all recently undertaken some intensive fuel management projects in their respective interface areas. Additionally, the District of West Vancouver has a reasonably comprehensive and trained natural area firefighting crew and resource base.

Principles

Natural area fire management is a critical program component particularly in urban areas such as the City of Surrey. The underlying management principles identified here were developed to ensure a balanced approach is taken in developing a fire management program for park natural areas.

The informing natural area fire management principles are:

1. Preserve and protect the integrity of natural area ecosystems

2. Protect human life and private property

Fire Management Goals and Objectives

The focus of fire management in Surrey's natural areas should be based on the prevention, detection, and suppression of human caused fires. The importance of Surrey's natural areas has been well documented and the protection of these resources should be a primary management goal.

The primary objectives of Surrey's *Natural Areas Fire Management Strategy* are to:

- Minimize the risk of fire to persons and property.
- Minimize the City's associated potential liabilities.
- Ensure the long-term conservation of our natural areas and their inhabitants.

These objectives are to be met using the following basic principles of fire prevention.

1. Minimize the risk of ignition.
2. Minimize potential fire behaviour utilizing accepted hazard reduction techniques.

3. Ensure a high level of preparedness through prevention and detection programs.
4. Ensure that fire suppression activities are compatible with the natural area management principles, themes, goals and objectives as outlined in the Overview of Natural Area Management Plan: Strategic Directions.
5. Ensure that post fire rehabilitation is conducted promptly and appropriately from both an ecological and environmental perspective.

Fire Management Program

Descriptive information on the fire environment is the basis for decision-making in any fire management program. The fire environment can be described as the interaction of fire, weather, fuels, and topography. Typically, it is characterized by regional-scale weather patterns and vegetation. Thus, a key management issue is the establishment of an electronic database that incorporates fire weather (including lightning location data), fire history, fuels, and fire behaviour information. Analytical tools are needed to provide daily, monthly, and year-to-year summaries and comparisons of data. These data must be easily accessible as an aid for making fire management decisions.

An understanding of fire history, natural and human caused, is important in fire management as it documents the frequency, distribution, and severity of past events. It also provides insight into the effects of fire suppression and potential long-term fuel build-ups within forested areas. An understanding of fire history also provides a disturbance template that can guide management practices, forest succession modeling, and fire behaviour analysis.

Fuel is important to ignition, build-up, and behaviour of fire more than any other single factor. Forest health problems, such as root rots that result in windthrow of trees and accumulation of fuels on the forest floor, may also contribute to fuel build-up. In some instances, stand level fire hazard may warrant some form of site level treatment to remove or reduce hazard. This is particularly true of areas adjacent to high incident interface and security areas, major structures and facilities, hydro and utility right-of-ways.

For the purpose of the *Natural Areas Fire Management Strategy*, the following definitions apply.

Fire Hazard: a fuel complex defined by volume, type, condition, arrangement, and location, that determines the degree both of ease of ignition and of fire suppression difficulty.

Fire Risk:

- A measure of the expected severity (e.g. how many deaths, injuries, dollars or damage per fire) for all fires or a particular type of fire,
- A measure of the probability of occurrence of all fires or that of a particular type of fire,
- An analysis of potential factors (e.g. human or natural) which can contribute to the potential for fire occurrence.

Inventory, Prevention, Detection, Suppression and Rehabilitation

The following describes the important components of the *Fire Management Strategy*. The recommendations are based on current fire management operations, which have been adopted by many agencies including Canadian National and Provincial Parks, US Forest Service, US National Parks Service, and the B.C. Ministry of Forests.

Inventory, Prioritization and Mapping of Areas for Fire

Fire Hazard and Risk

Fire History: develop and maintain a fire history database.

Discussions with Surrey Park's staff indicate that there is no formal record of previous park natural area fires. From a vegetation management and public safety point of view some of the most important attributes are as follows:

- Cause
- Location
- Time of year
- Site association and successional stage (fuel type)
- Area burned
- Canadian Forest Fire Weather Index (FWI) System codes and indexes
- Control/suppression tactics and results.

It is recommended that Parks begin compiling a historical fire database, which should be updated and reviewed annually. The Fire Department needs to assist this endeavor by providing Parks with all incidences of park natural area fires

Hazard Assessment: develop an inventory program to identify areas of high hazard.

Information on the types of fuels present and the quantity of forest fuels within the City is not currently available. To adequately address some of the key fire management concerns, a natural area fuel survey should be conducted in the natural areas managed by Parks.

Prioritize hazard/risk activities

The "Interface Community Fire Hazard Form" (see Appendix B) developed by the Ministry of Forests is recognized as a standard approach to hazard evaluation. Parks should adopt an evaluation of this type as the method used to evaluate fuel type hazard. Assessments should be prioritized based on the following:

1. Risk of ignition
2. Values at risk (adjacent private or public development),
3. Fire suppression difficulty
4. Maintenance of public safety

Based upon a relative comparison of the sites, prioritize the sites for detailed, site level risk and hazard assessments. Prioritize based upon the identified dominant vegetation's fire hazard rating, a quick overview assessment of values at risk and the estimated type

and amount of public usage. Consider the following characteristics to aid in creating a basis for comparison:

- Size, continuity and type of vegetated areas
- Relative abundance of potentially affected proximal properties or structures (i.e., interface zones—any area where development and wildland fuels meet such as natural areas abutting flammable developments or flammable structures)
- Estimated ignition risk factors based on perceived total usage, user profiles and presence of obvious high hazard characteristics
- Accessibility and distance from nearest firewall
- Relative availability of water sources
- Identified intrinsic site values including ecological, environmental, social, economic and heritage values
- History of fire incidences (if records available)

When prioritizing areas for intensive risk and hazard assessments, precedence should be given to large, high value, high use sites with a large interface component.

Visual fuel hazard surveys and risk assessments are the preferred method. When performed by an experienced observer, these surveys provide the necessary level of detail in an efficient, cost-effective manner compared to detailed, plot and transect based inventories. These site-specific assessments should be photo documented and carried out at all sites, in priority order, every 2-5 years.

Each of the natural areas within the City should be subject to an overview inspection and possible follow-up inventory, assessment and prevention activities. Based on the evaluation of the previous criteria a site-specific fire management plan may be developed. The purpose of a site-specific plan is to address fire management issues or features that are outstanding or unique to a particular site that require specific attention or remediation in order to meet objectives.

Site Mapping

Subsequent to inventory and site-specific prioritization, both aerial and on-site mapping should be carried out. Aerial photos of each natural area should be generated, and for each site, map appropriate specifications should be identified and documented. Site features should include properties, structures, utilities, water sources such as fire hydrants, access and escape routes, vegetation cover, and any extreme safety hazards. In addition to site-specific features the location of the two nearest municipal fireballs for each site should also be identified.

Prevention

Fire prevention strategies should include the following areas, fire risk abatement, public education, fire hazard abatement, access management, fire weather and planning. Details of these six strategies are as follows:

Fire Risk Abatement

- Develop a training program to increase the level of staff awareness in the area of fire prevention. Staff awareness is one of the most critical factors in the reduction of unwanted fire ignitions within natural areas. It is the responsibility of Parks to educate other City operations sections on forest fire conditions. The elements of a staff training program should address the following key areas.
    - Provide all Parks and Engineering operations staff with basic general wildfire awareness, prevention and reporting information.
    - Lease with local Community Policing Stations and Bike Patrols.
    - Ensure that basic fire safe work procedures are posted in all equipment sheds and that, during high fire risk periods, all employees receive a verbal or written refresher as to these work practices. Monthly Safety meetings or weekly supervisors meetings would provide an effective means of communicating the messages to all staff.
    - Ensure all employees are familiar with the locations and operation of fire extinguishers.
    - Develop an operational forest fire risk classification scheme for specified operational activities.

Operation of power equipment and other operational activities within or near natural areas can create a significant risk during periods of high fire danger. The City of Surrey should adopt a forest fire risk classification system for specified operational activities within natural areas. The purpose of such a classification is to ensure that during periods of high fire risk that operational activities are conducted in such a way that any risk of fire is minimized. This may mean that certain high-risk activities are curtailed or stopped during certain periods of the fire season. A system specific to Park operations could be modeled after risk classification contained in the "Fire Prevention and Suppression Regulation of the Forest Practices Code of B.C" and related to the current level of fire danger. Fire danger should be calculated using data from an on site weather station maintained by the City.

Public Education

- Provide public education programs focused on awareness, prevention and detection of urban/wildland interface fires.

Public education should be focused on residents who live adjacent to natural interface areas of the City. The natural/urban interface is growing with both increasing development and population and this growing population within the interface increases the risk of fire ignitions. Within the City, the Fire Department and the Parks, Recreation and Culture Department should initiate a cooperative program to promote fire prevention strategies and

provide information on fuel and fire conditions in the natural/urban interface. The Ministry of Forests has a comprehensive information package ("Fire Safe") that should form the foundation of materials required for this type of program. Other education opportunities could include the development of fire awareness through interpretive displays at public functions held by both the Parks and Fire Departments, or notices in local newspapers at times of high fire risk.

In areas of high hazard Parks should establish signage to alert the public of fire danger risk ratings during periods of high and extreme hazard. Additionally, Park's should post fire danger information on kiosks and other high profile park areas and consider closing parks in extreme circumstances.

Fire Hazard Abatement:

- Identify and incorporate vegetation management strategies in annual work plans to reduce fire risk:

A Parks urban forest management team should be responsible for the selection of vegetation and fuel management strategies for each site. Selection of appropriate strategies should be based on a vegetation inventory, current risk, an understanding of ecological succession, and the desired future condition of the site.

Three general key strategies are recommended as follows:

- Creation of a defensible space between structures, individual properties and natural area vegetation
- Creation of defensible space between community and natural areas
- Manipulation of vegetation and fuels

Equally important is the care and maintenance of native vegetation. Proper species selection, irrigation of new plantings, control of invasive/exotic species, removal of yardwaste and proper plant care can all help to reduce risks. For extreme high risk areas, further management measures, such as selective thinning or lift pruning, should be considered.

- Identify and conduct fuel management activities to reduce risk of fire.

Inventory data and future management plans for forested portions of the City must capture the complexity of forest age classes (fuel classes) present throughout the region, and identify an appropriate management strategy to reduce the risk of fire. Management strategies should include evaluation of risk associated with adjacent development sites, high-risk human activities, and the remote possibility of lightning fires. Fuel management may be required in areas of high visitation, around specific facilities and structures, along highways and roads, and in areas where fire may severely impact upon the vegetation resource present in the area.

The recommended basic principles for fuel management are as follows:

For indigenous materials:

- Whenever possible employ fuel conversion techniques as opposed to removal of materials from the site.
- Move fine fuels away from high risk areas and disperse to reduce the hazard.
- If fuel loads are extremely excessive, remove a portion of them from the site completely and apply hazard reduction techniques (see below) to the remainder; retain as much native material as possible on-site.
- Employ sound arboricultural techniques when performing ladder fuel management activities.

For non-indigenous materials:

- Remove all non-indigenous debris from sites.
- Remove invasive non-indigenous plants from site—they can choke out existing vegetation and potentially create excessive amounts of fuel materials.

Strategies for fuel management may include a number of options:

- Creating a network of standing timber fuel breaks.
- Establishing cleared fuel breaks (roads, right-of-ways etc.) in areas of high risk.
- Planting and managing for fire resistant species such as alder and cottonwood.
- Fire proofing stands through silviculture operations (precommercial/commercial thinning, regenerating deciduous species).
- Reducing or completely removing any significant fuel accumulations, if tree removal is required.

These types of fuel management techniques should be used in those areas where fuel loadings and hazard are considered a significant risk to public safety, values at risk, and natural area resource values.

Exclusions to Reducing Fire Risk

The use of prescribed fire as a hazard abatement tool and other methods of simulating the effects of fire are not thoroughly addressed in this document but should be considered in the future to emulate the ecological roles of fire in ecosystems when required. This is not viewed as a high priority in many of Surrey's natural areas due to the relative infrequency of wildfire in a natural coastal forest ecosystem (100-300 years). In addition, most of Surrey's forested areas have been subject to clear-cut logging, broadcast slash burning within the last century and are only in the relatively early seral stages, representative of those found following a fire initiated stand fire.

Access Management:

- Actively manage access in areas of high fire risk.

Fire management planning in each of the natural areas of the City must consider access management as an important component of fire prevention, fire detection, and fire suppression. Control of access provides an additional tool available to the City to reduce the level of fire risk within natural areas. Access controls include closing natural area parks and trails with gates or signage to limit the number of people entering a specific area and reduce the potential for unwanted activities (such as late night parties).

Additionally, where fire risk is high, providing access to enable fire fighting should ensure prompt fire response. This could entail ensuring existing trails are maintained to permit ready and quick entry to the point of fire.

Other important access considerations include:

- Regular inspections to insure that all gates and bridges are in good working condition.
- Standardization of locks on all gates on all subject lands.
- Availability of keys for all involved agencies where applicable.

Fire Weather:

- Establish a dedicated fire weather station for Parks operations use.

The Parks, Recreation and Culture Department should establish one or more dedicated fire weather stations within the City to provide fire weather information. Daily on site fire weather information from the start of the fire season (April 15) is needed to monitor the following fire weather parameters: maximum temperature, 1200 standard time readings of temperature, relative humidity, daily precipitation and wind.

The Parks, Recreation and Culture Department currently monitors forest fire weather data provided by the Coastal Fire Center. Fire weather data is considered an essential element of a basic fire management program. The information is considered critical in the determination of fire hazard conditions, and in the event of a large fire, would also provide important data for forest fire behavior prediction. The information would also serve as a historical fire weather database, which could be used to evaluate previous fire conditions, to make specific fire weather comparisons between seasons and to aid in the planning and implementation of fire restrictions. The collected weather data could also be used by staff, researchers or other resource professionals for the development of fire prevention and public education programs.

Planning:

- Incorporate natural area fire prevention recommendations, strategies and principles into all planning, design and construction activities for all urban/interface areas of the City.

City and park planners have the ability to play an integral role in the reduction of fire risk in natural areas throughout the City. It is important that planning staff consider urban/interface fire prevention standards as outlined in the *Beware and Prepare Community Planner* as part of the planning process. Park planners should ensure that all new park design plans consider

fire prevention and safety. This would include such things as the creation of defensible space between parkland and private property or ensuring the availability of an adequate water supply to all areas of high risk within a specific natural area.

Detection

- The general goal is to utilize City staff, volunteers, the general public, signage, and effective communication strategies to improve fire detection.

The early detection of forest fires should be a key component of the overall fire management effort. The earlier suspicious smoke is located and suppression crews are dispatched, the greater the probability of reduced damage to public and private property. Currently, fire detection is accomplished by an alert public and City staff. Fire information is then forwarded to the City Fire Department for suppression.

Because detection of forest fires relies heavily on public awareness and response, Parks should facilitate fire awareness through improved park signage and the education programs. Good signage including identification of park entrances and trail systems will help park visitors provide accurate fire location information. Fire reporting information should be posted at strategic locations allowing visitors to respond quickly and report the fires to the Fire Department.

Any organized detection program should utilize local residents and volunteers for high hazard areas or for areas with a history of fires. During periods of high to extreme hazard the Parks, Recreation and Culture Department should schedule regular patrols of these areas. Staff, temporary fire wardens, and/or community volunteers could conduct regular patrols. Where the risk of hazard is considered high within a specific area the use of resident caretakers should be considered. In addition to the detection function, these caretakers can assist by alerting the public of current fire danger conditions.

Effective detection is heavily dependent on good communication. All departments within the City must be made aware of the chain of command, protocols and procedures for reporting urban/interface fires. This means that a formal contact list should be circulated through all jurisdictions of the City. The contact list would identify all members of the Fire Department and Parks, Recreation and Culture Department who are responsible for forest fire management. Additionally, the contact list must contain all appropriate Ministry of Forests personnel in both the Chilliwack District and the Coastal Fire Center. This contact information should be reviewed, updated and circulated annually at the beginning of the fire season (prior to April 15th).

Suppression

The Fire Department is responsible for all natural area fire suppression activities. Responsibilities include fire preparedness and pre-suppression planning, initial attack, fire suppression and mop-up. Fire Department Operating Guideline, 2.17.13, Fire Suppression Wildland/Urban Interface (see Appendix A), outlines the response protocol for fires in urban forested areas. Although the Forest Protection Branch has withdrawn or reduced their role in

actively being engaged in the extinguishment or containment of a fire occurring within the City's forests, it appears the Fire Department still relies on their support (see section 2 of the Fire Department Operating Guideline).

Even though the Surrey Fire Department is the lead agency in natural area fire suppression within the City, natural area fire fighting is highly specialized, particularly if the mandate is to suppress fires in a method that also sensitive to the ecology of the site. There is a need for the Fire Department to engage in specialized training in the suppression of natural area fires and to acquire specialized fire fighting equipment in order to effectively suppress a natural area fire and minimize ecological damage.

The Parks, Recreation and Culture Department currently assumes no responsibility for fire suppression activities for any of the parks or natural areas under its jurisdiction

Given that many small fires occur in isolated forested areas it seems appropriate that Park Division field staff be equipped to extinguish these small ignitions. To provide this capability, Parks Division vehicles could be equipped with basic fire fighting tools including a backpack pump filled with water, a fire shovel and a pulaski. This level of preparedness, although not serving a true suppression function, would help minimize the risk of fires spreading prior to the arrival of Fire Department.

Once a fire has been extinguished, the Parks Division Urban Forestry and Environmental Services Section should immediately undertake site rehabilitation efforts. Utilizing both staff and volunteers these efforts can include, but are not limited to, the following activities:

- Hazard abatement
- Erosion control
- Provision of lost habitat elements
- Planting site preparation
- Re-vegetation and reforestation
- Selective reintroduction of key wildlife species (when needed)
- Wildlife rescue

Rehabilitation and Mitigation

- Rehabilitation and mitigation strategies should be developed that are consistent with ecosystem and vegetation management goals for areas disturbed by fire.

Fires have the potential to dramatically alter ecosystem structure and function. Rehabilitation and mitigation plans and actions need to be developed that focus on post-fire erosion control, limit the effects of fire on accelerated sediment and nutrient release and provide for re-establishment of native vegetation. At this time the Parks, Recreation and Culture Department has not carried out any planning that is specifically related to post-fire rehabilitation.

There are two options for post-fire rehabilitation. The simplest approach is to monitor the effects of fire in terms of plant recovery, erosion, and impacts on downstream water quality and rely on natural processes to mitigate fire effects. This approach is appropriate for small fires that result in a small area burned. For larger areas it may be necessary to intervene in natural processes where the area damaged by fire is extensive. Parks has the ability to apply basic rehabilitation techniques such as seeding, erosion control, and re-vegetation on a small scale. Plans to deal with the mitigation of large natural areas have not been developed yet.

In order to ensure ecosystem protection in the event of a fire, rehabilitation and mitigation strategies should be as follows:

- Develop a comprehensive rehabilitation plan that outlines mitigation strategies to limit the effects of a large fire on ecosystem structure and function.

In coastal BC, there is a growing body of information on watershed restoration following disturbance. In Washington, Oregon, and California, a number of rehabilitation efforts have been successfully carried out following large fires. The Parks, Recreation and Culture Department should draw on this information base. Rehabilitation planning should be consistent with the ecosystem-based approach to vegetation management. Any rehabilitation plan should focus on,

a) Erosion control
b) Short-term re-vegetation strategies
c) Long-term reforestation
d) Removal of fire-killed trees should also be considered if they pose a significant risk to public safety.

- Develop a rehabilitation strategy that directs the extent, standards and techniques to which rehabilitation should be applied.

The objective of any rehabilitation efforts should be focused on minimizing the effects of fire on site productivity losses and reestablishment of native vegetation, which meet the long-term objectives of the City. This strategy must be consistent with an ecosystem-based management approach and where possible should mimic natural processes (e.g., leave snags to maintain forest structural diversity, use native plant species).

- Identify team members and their respective roles and responsibilities in a rehabilitation operation.

The rehabilitation team will need to be coordinated by Parks, with involvement of the Fire and Engineering Departments and possibly representatives from government agencies such as Provincial Ministry of Land, Air and Water Resources.

Training and Equipment

Parks Division

- The Parks Division should increase the level of staff expertise in fire management.

A fire management program has yet to be developed by the Parks Division, due in part to the fact current staff do not possess the required experience and skills in wildland fire management. A formal fire training program and a supporting manual should be developed for the Parks Division and this manual should outline the basic fire management training requirements, the safety requirements, and the equipment operation. It should also outline the minimum standards required such as, period of certification, fitness requirements, and first-aid training.

There are a number of training courses available through the BC Ministry of Forests Protection Branch. Training could be facilitated through a Ministry approved private consultant or through a cooperative agreement with staff from the Protection Branch of the Ministry of Forests. The following list of courses is applicable.

- S-100: Basic Wildland Fire Suppression and Safety, (Summary of S-130, S-190 & S-232)
- S-210: Fire Cause Investigation
- S-211: Fire Weather
- WCB: Fallers Certification Course

Additional training related to risk and hazard assessment, fuel management, fire ecology, and public education should be explored and specific staff members should receive training appropriate to their duties.

All City Operations Crews—

- City operations crews should receive awareness training for fire-safe maintenance and operation of machinery and equipment.

To ensure fire safe operations, all City operations crews should receive adequate training related to the operation and maintenance of machinery and equipment. Fire training should include a module on the use of fuels and the handling of other flammable materials in compliance with WCB operational guidelines and regulations. Training should be formalized in the City's *Occupational Health and Safety Plan*. Mechanical shops and those charged with the maintenance of equipment should be responsible for annually inspecting equipment to ensure that all spark/flame arrestors and heat shields are intact and functioning according to manufacturers specifications.

All City vehicles, machinery and outbuildings could be equipped with fully functional fire extinguishers.

Department Collaboration and Cooperation

- It is strongly recommended the Fire Department and Parks Division open lines of communication to ensure the best delivery possible for fire management of park natural areas.

Although the division of responsibility for fire management in park natural areas is quite clear, with the Fire Department responsible for fire suppression and the Parks Division responsible for all else, much can be gained should the two agencies work more closely. For instance, the Parks Division should share park inventory information, particularly trail coordinates, and fire inventory information with the Fire Department. This would enable the Fire Department to better access points of fire and also be alerted to areas of high risk. Conversely, the Fire Department should inform Parks of fire incidences in park natural areas to better enable Parks to develop fire history which, in turn, facilitates implementation of better prevention and detection activities for particular areas.

- It is strongly recommended that an annual meeting involving all key stakeholders be held to review and, if necessary, augment the *Fire Management Strategy* as needed.

These meetings should be held during the winter season allowing the stakeholders to prepare for the next fire season. The overall purpose of the meeting would be to share pertinent information, coordinate activities and collaborate on natural area fire management.

Funding and Resource Acquisition

The Fire Department has indicated willingness to discussing the shared cost of acquiring the necessary equipment and to performing fire prevention activities including physical fuel management and public education.

The Parks, Recreation and Culture Department has committed to the design and implementation of a *Natural Areas Fire Management Strategy*. It is anticipated that some of the current Parks Division annual budget allocations will be used to carry out recommendations contained within this Strategy.

Mutual Aid Agreements

Where there are inter-agency or departmental overlaps in land ownership or stewardship, a mutual aid agreement defining the roles and responsibilities for those lands should be cooperatively entered into ensuring that the principles of the *Natural Areas Fire Management Strategy* are implemented. Generally speaking, the parties normally responsible for management of the subject land should be primarily responsible for the implementation of prevention measures. Suppression activities should be handled as stipulated in a mutual aid agreement or according to current standards whereby the Municipal Fire Department will suppress any such fires on lands within their jurisdiction.

The Municipal Fire Department is responsible for pursue and maintain any mutual aid agreements between the City and other land owners. This will help to ensure that the agreements are made within the capacity of the Fire Department to deal with them.

Appendix A

Ministry of Forests Operating Guidelines

Ministry of Forests, Provincial Forest Protection Branch, Operating Guideline 2.17.13, Fire Suppression Wildland/Urban Interface.

Appendix B

Interface Community Fire Hazard Form.

References

BC Ministry of Forests, Protection Branch. *Beware and Prepare Community Planner*. Ministry of Municipal Affairs, Office of the Fire Commissioner, 1994.

British Columbia. *Forest Practices Code Biodiversity Guidebook*. BC Ministry of Forests and BC Ministry of Environment, 1995.

BC Ministry of Forests, *Field Handbook for Prescribed Fire Assessments in British Columbia: Logging Slash Fuels,* 1994.

Justice Institute of BC, Fire and Safety Division. *Wildland Firefighting: Basics for the Structural* Firefighter. Justice Institute, 1993.

BC Ministry of Forests, Regulations—Forest Practices Code of British Columbia Act: Forest Fire Prevention and Suppression Regulation (Schedule 7), 1995

Walstad, J., S. Rasdosevich, D. Sandberg. *Natural and Prescribed Fire in Pacific Northwest Forests*, Oregon State University Press, 1990.

British Columbia Office of the Auditor General, Report 1: Managing Interface Fire Risks, February, 2001.