

Forest Health Strategy For Mount Robson Provincial Park



Submitted By

***B.A. Blackwell & Associates Ltd.
Compass Resource Management***

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Introduction

Mount Robson Provincial Park (the 'Park') is a Class A park located on the west slope of the Rocky Mountains along the Alberta-British Columbia border, adjacent to Jasper National Park. Established in 1913, the Park covers an area of over 225,000 hectares and includes variants of the Alpine Tundra (AT), Englemann Spruce-Subalpine Fir (ESSF), Sub-boreal Spruce (SBS), and Interior Cedar Hemlock (ICH) biogeoclimatic zones. Along with Jasper and Banff National Parks, Mt. Robson Provincial Park has been designated a World Heritage Site by the United Nations Environmental, Scientific, and Cultural Organization.

Key features of the park include world class climbing and hiking opportunities and important habitat for a wide range of species including ungulates, caribou, grizzly bears and a large number of migratory and resident birds. The park also contains a strategic road and rail travel corridor that links British Columbia to Alberta.

During the construction of the railway line through the Park in 1913-1915 much of the travel corridor was burned. This, coupled with successful forest fire suppression since the 1940s, has produced large stands of even-aged forests that are slowly maturing. The resultant uniform age-class distribution is not considered representative of historic composition and structure of the forests within the park. Historically forests within these sub boreal ecosystems contained much larger areas of early seral forests.

Since 1997, Mountain Pine Beetle has been active in the Swiftcurrent drainage along the western boundary of the Park. Over the past three years, this infestation has increased significantly in size, and spread along the Yellowhead Highway corridor east beyond Moose Lake. Localized incidence of the beetle has been identified as far east as Jasper National Park (JNP).

As identified in earlier planning documents (Blackwell *et al.* 1996 and Blackwell 2000) there are three inter-related forest health and ecosystem management issues that need to be addressed by this strategy. Each of these issues pertains primarily to the main valley and travel corridor that runs through the park:

1. Seral Stage Distribution: Lower elevation forests of the Sub Boreal Spruce (SBS) biogeoclimatic zone within the park are dominated by lodgepole pine that was established by human caused fires during the construction of the railway line through the Park in 1913 (Figure 1). With the exception of at least two cohorts of veteran Douglas-fir, and more minor components of white spruce associated with wetter sites, the average age of lodgepole pine within these forests is 92 years. A literature review conducted as part of the development of the EMP, identified the absence of old and early seral forest within the SBS portion of the park. The EMP literature review was further supported by work published by Delong and Tanner (1996) that outlines seral

targets for the SBS. Based on the EMP literature review and work by DeLong and Tanner the seral distribution within the SBS portion of Mt. Robson park are lacking both in the distribution of old and early age class forests.

Table 1. Targets for seral stage distribution and patch size distribution for Mt Robson (from DeLong 2002).

Natural Disturbance Unit	Stand Replacement Disturbance Cycle	Time since disturbance distribution (% of total forest area)				Patch Size (% of total disturbance area)				Disturbance type (% of disturbance area)	
		>250 yrs	>140 yrs	>100 yrs	<40 yrs	>1000 ha	100 - 1000 ha	51 - 100 ha	<50 ha	Stand Replacement	Gap Replacement ^a
ESSFmm	300	39 - 50	58 - 69	66 - 77	10 - 22	60	30	5	5	70	30
SBSdh, ICHmm	150	15 - 25	33 - 49	43 - 62	19 - 36	70	20	5	5	90	10

^a Gaps generally < 1ha in size and removing < 40% of the basal area of a stand.

Ecologically these lower elevation SBS forests are uniform in age and structure and have been under attack by mountain pine beetle since 1997.

2. Mountain Pine Beetle: There is a significant percentage of forest that is estimated to have high to extreme susceptibility to Mountain Pine Beetle (Figure 2). The latest incidence surveys show that the spread of the beetle through the park has reached JNP (Figure 3). While it is recognized that the mountain pine beetle infestation within the park cannot be fully stopped, the ecosystem management group believes the rate of infestation spread to Jasper National Park can be reduced through management actions. Accordingly, falling and burning has occurred over the past two winters in the area east of Yellowhead Lake to the Jasper townsite. Slowing the beetle spread to Jasper National Park will allow for treatment activities to be undertaken in the park to help reduce the spread of beetles to Alberta forests.

3. Fire Hazard: There is a significant percentage of forest that is estimated to have a moderate to high wildfire hazard (Figure 4). The area of the 1913 fire and a number of other fires that occurred during or after 1889 (Tande 1979) extend all the way to the town of Jasper and forms a uniform and contiguous C3 fuel type that is susceptible to catastrophic wildfire. The Syncline Fire of 2003, located east of Jasper townsite in the Park, demonstrated the fire behavior potential within this C3 fuel type; where during one burning period the fire growth exceeded 8,000 ha. Additionally, there were a number of days where fire growth exceeded 2,000 ha. Through a joint working group of federal and provincial agencies, B.C. and Alberta having been actively planning wildfire fire management strategies, including construction of fuel breaks, prescribed burning and community wildfire protection planning within both jurisdictions.

The purpose of this report is to document the process and final recommendations for a 10-year forest health management strategy for Mount Robson Park. The strategy is guided by the broader Provincial Pine Beetle Management Program

Strategy (MWLAP 2003) and all of the related policies and regulations related to vegetation management within parks and protected areas within the Province of British Columbia. The strategy is also consistent with the final recommendations of the Firestorm 2003 report (Filmon *et al.* 2003).

Strategy Development Process

The strategy development process centered around three workshops of the Mount Robson Ecosystem Working Group in January and April 2004 and April 2005. The first workshop involved a detailed review of the issues, an examination of treatment options and a preliminary identification of potential treatment sites. The second workshop involved a detailed review and evaluation of different combinations of site treatments spread over a 10-year planning horizon.

Working Group participants included:

- BC Ministry of Environment, Environmental Stewardship Section
- BC Ministry of Forests
- Parks Canada, Jasper National Park
- Alberta Ministry of Sustainable Resource Development, Forest Health Section
- Natural Resources Canada – Canadian Forestry Service

Management Objectives

Working group participants have identified the following management objectives for addressing ecosystem management issues in Mt. Robson Park:

- reduce mountain pine beetle infestations within the park and mitigate its spread to Jasper and Alberta;
- reduce wildfire threats to park visitors and facilities and adjacent communities; and
- improve biological diversity within the park.

Treatment Options

The 10-year management strategy for Mount Robson Park is comprised of a combination of three treatment types:

Single Tree Treatments (fall and burn)

Single tree treatments, in particular the use of falling and burning individually infested trees, has been the dominant tactic used by BC Parks to treat beetle

infested areas in parks and protected areas. This treatment is effective in controlling low level incidence before beetle populations have reached epidemic population levels¹ When conducted on a small scale, this treatment has a limited impact on site-level conservation goals and is considered cost-effective. Fall and burn treatments are particularly suitable in cases where infested trees pose a direct threat to human safety (e.g., in and around campgrounds).

Within this strategy, falling and burning is viewed as a short-term tactic, best applied at the leading easterly front of the mountain pine beetle incidence.

Prescribed Burning

In designated areas within the park, prescribed fire can be an effective tool for addressing the inter-related issues identified above. In particular, prescribed fire can be used as a tool to alter the seral stage (age class) distribution, thus reducing the area susceptible to Mountain Pine Beetle and the resulting fire hazard associated with large-scale tree mortality. Changes in seral stage distribution associated with prescribed fire reduces the requirements for single-tree beetle treatments and reduces the probability of unplanned, large scale, catastrophic wildfires that may have negative consequences to resources both within and adjacent to the park.

Within Mount Robson Park, prescribed burning is viewed as the preferred landscape-level tool that meets the long-term ecosystem management goals for the park. It plays a dominant role within the strategy.

Selective Tree Removals

Over the past several years there has been a realization within B.C. Parks that tree removal is a required tool necessary to address issues related to public safety, forest ecosystem restoration, and forest health. While commercial logging or salvage is not allowed in parks and protected areas, legislation and policy changes have been made to facilitate tree removal where treatments are deemed necessary to restore ecosystems or protect public safety.

Tree removals are prescribed based on a strict set of criteria and guidelines focused on meeting ecological goals and objectives, while at the same time minimizing the immediate site-level impact. The current beetle infestation in B.C. has caused B.C. Parks to consider tree removals where fuel accumulations present a significant fire risk to public safety and communities.

Tree removal within Mount Robson Park will only be used to prepare for prescribed burns, to create fuel breaks and in areas where it is the best option to address beetle infestation sites to slow the advance of beetle attack into Jasper National Park. Proposed tree removals will alter the current species composition

¹ Although use of the herbicide Monosodium Methanearsenate (MSMA) is allowed under current policy, it has not been considered within this strategy given the lack of acceptance by the general public.

such that forest health risks are reduced, and will have limited but acceptable environmental impacts when compared with the alternative of landscape scale beetle mortality similar to events experienced in Tweedsmuir and Manning Provincial Parks.

Construction of permanent roads and landings will not be considered for any green attack tree removal. All access structures will be designated temporary and subject to the highest standards of rehabilitation.

All tree removal activities will be limited to the Yellowhead Highway travel corridor within the park in two specific areas;

1. West of Shale Hill in the vicinity of park headquarters to the western boundary of the park adjacent to Swiftcurrent Creek. Tree removals in this area of the park will facilitate wildfire community protection for the interface community in the Swiftcurrent Creek drainage and the protection of park facilities in and around the park headquarters and campground area.
2. East of the Moose River to the B.C./Alberta border. Tree removals in this area of the park will be to used to construct a fuel break at the east end of the proposed Yellowhead West prescribed fire and either fall and burn or tree removal of green attack based on the three objectives described above.

Any tree removal activities will be included in a detailed prescription that outlines site specific restoration and ecological goals that are consistent with the EMP and the maintenance of ecosystem process and function such as mimicking natural disturbance patterns both at the stand and landscape level.

Effective monitoring of results on an annual basis and re-adjustment of priorities and prescriptions over time is viewed as essential for successful implementation of the strategy over the 10-year period. The monitoring for tree removals will be guided by the management objectives outlined in the ecosystem management plan. Ecosystem management plan monitoring objectives are outlined in Appendix A.

Site Descriptions

The sites identified for each treatment technique were selected based on a preliminary analysis of forest cover (i.e., % pine), stand age and treatment feasibility. Table 1 provides a brief synopsis of each proposed treatment zones.

Table 1: Summary of Proposed Treatment Zones

Treatment Type	Site	Area ¹	Forest Cover (% pine)	Average Stand Age
Prescribed Burning	Moose Lake (2004)	2,887 hectares	62 %	103 yrs
	Swiftcurrent	2,200 hectares	56 %	158 yrs
	Yellowhead West	3,100 hectares	66 %	109 yrs
	Upper Fraser	650 hectares	75 %	183 yrs
	TOTAL	8,837 hectares		
FireSmart Tree Removal (Fire preparation only)	Lucerne Pilot (2004)	39 hectares	87 %	130 yrs
	Swiftcurrent	117 hectares	30 % ²	88 yrs ²
	Headquarters	188 hectares	50 % ²	105 yrs ²
	TOTAL	344		
MPB Tree Removal (Single tree green attack only)	Yellowhead West to the BC Alberta border	Green attack only within 6,945 hectares ³	77 %	121 yrs
	TOTAL	6,945 hectares treated area		

¹ Except for the Moose Lake prescribed burn and Lucerne pilot tree removal sites that have prescriptions under development, **all areas are estimates until such time as detailed prescriptions are developed and will be reviewed and amended annually.**

² Based on partial data (within park only)

³ Tree removal will only be utilized where it is most effective and environmentally suitable. This is the overall size of the area in which MPB green attack tree removal will be conducted in and does NOT reflect that 6,945 ha of trees will be removed.

Results

The proposed location of treatments across Mount Robson Park is shown in Figure 5 and Figure 6, and the preliminary schedule for these treatments is shown in Figure 7. The expected results from implementation of these treatments

on MPB management, wildfire hazard and landscape-level biodiversity are discussed below.

Mountain Pine Beetle Management

The benefits from a mountain pine beetle (MPB) management perspective include both the reduction in MPB hazard area and the ongoing elimination of green-attack infested areas.

Prescribed fire and tree removal treatments are the means of returning areas of extreme and high MPB hazard ratings to low ratings. It is assumed that both prescribed burning and tree removal will be equally effective at reducing MPB hazard ratings given the type of restoration prescriptions required in both cases (i.e., a primary focus on mortality or removal of mature lodgepole pine).

Table 2 reports the total area of extreme and high MPB rating in each proposed treatment zone (i.e., prior to 2004). Accounting for the overlap of some treatment zones, the end result of implementing all treatments would be the elimination of nearly 2,000 hectares of extreme and high rated MPB hazard area.

Both the fall and burn program and the tree removal program will target current green-attack trees and areas.

Table 2: Summary of MPB Hazard Reduction Potential

		Total Zone	MPB Hazard Area		
		ha	Extreme ha	High ha	Sum ha
Prescribed Burn Sites	Moose Lake - Burn 2004	2887	370.2	218.5	588.6
	Swiftcurrent	2200	8.8	72.9	81.7
	Yellowhead West	3100	540.4	306.9	847.3
	Upper Fraser	650	0.6	359.0	359.6
	Total	8837	920.0	957.3	1877.3
Tree . Sites (green attack & fire preparation only)	Lucerne - Pilot 2004	8	0.0	8	8
	Yellowhead West to BC/AB border	- ¹			
	Swift Current	117	data not available		
	Park HQ	188	data not available		
	Total	313			8

¹ 2005 – 1319 trees were felled and burnt in this zone.

Fire Hazard Management

To primary benefit from a fire management perspective is to return areas of extreme and high fire hazard ratings to low ratings. Again it is assumed that both prescribed burning and tree removal will be equally effective at reducing fire hazard ratings given the type of restoration prescriptions required in both cases.

Table 3 reports the total area of extreme and high fire rating in each proposed treatment zone. Accounting for the overlap of some treatment zones, the end result of implementing all treatments would be fuel hazard reduction on over 4,700 hectares of high and moderate rated fire hazard area.

Table 3: Summary of Fire Hazard Reduction Potential

		Total Zone	Fire Hazard Area		
		ha	High	Moderate	Sum
			ha	ha	ha
Prescribed Burn Sites	Moose Lake - Burn 2004	2887	1268.4	1137.0	2405.4
	Swiftcurrent	2200	180.4	1277.1	1457.5
	Yellowhead West	3100	1960.5	719.9	2680.4
	Upper Fraser	650	246.0	332.0	578.0
	Total	8837	3655.2	3466.1	7121.3

Landscape-level Biodiversity

The past (1995), current (2005) and projected (2015) areas for the early, mid, mature and old seral stages of the ESSF, SBS and ICH are shown in Figure 8. The figure also includes the target prescriptions for early and old seral stages from Delong (2002). Conclusions that are drawn for each seral stage include:

ESSF:

- The fires that have occurred in the park between 1995 and 2005 have moved the current area of early seral stage toward the target range.
- The projected prescribed fires between 2005 and 2015 would move additional mid seral stage to early, achieving the target range.
- The majority of the mature seral stage is left for long-term recruitment into old seral stage.

SBS:

- The fires that have occurred in the park between 1995 and 2005 have moved the current area of early seral stage toward the target range.
- The projected prescribed fires between 2005 and 2015 would move additional mid seral stage to early, achieving the target range.

- The major jump in mature seral stage area to 2015 is a step toward long-term recruitment of old seral stage, but also signals higher landscapes-level MPB hazard in the future.

ICH:

- Between 1995 and today, there has been no progress toward achieving early and old seral stage targets.
- Including the Swiftcurrent prescribed burn by 2015 would move the area of early seral stage into the target range.
- The major jump in mature seral stage area to 2015 is a step toward long-term recruitment of old seral stage, but also signals higher landscapes-level MPB hazard in the future.

In general, the proposed prescribed fires help to achieve the target early seral stage areas for all BEC zones by 2015, with only a minor delay in the recruitment of old seral stage areas. The long-term recruitment of additional old seral stage area in the SBS and ICH, as evidenced by the significant increase in mature seral stage area, indicates a likely increase in landscapes-level MPB hazard area over time.

Implementation

Implementation of the strategy will have costs associated with planning and management, single tree treatments, prescribed burn treatments and tree removal treatments. There may be some revenues associated with the green attack and fuel break tree removals. The proposed phasing of the various projects is as follows:

- The priority on timing for the prescribed burn sites is:
 - Moose Lake = completed 2004
 - Swiftcurrent = Year 3
 - Yellowhead West = Year 4
 - Upper Fraser = Year 5
- The priority on timing for the tree removal sites is:
 - Lucerne Pilot area = completed 2004
 - Swiftcurrent/Park Headquarters = Year 2
 - Yellowhead West firebreak = Year 3

Final Recommendations

Based on the information presented above, and further supporting analysis undertaken since the development of the Park Ecosystem Management Plan in 1996, the Mount Robson Ecosystem Working Group recommends the following:

- The program of Single Tree Treatments, Prescribed Burns and Tree Removals should be implemented as described above to meet the forest health objectives of the park while reducing the risk of Mountain Pine Beetle spread and wildfire. **All operational components of this plan will be developed through specific site prescriptions and assessments.**
- The Working Group should continue to meet annually (or more often if necessary) in order to review monitoring results, develop annual implementation plans and refine the 10-year strategy as required.
- A Communication Strategy should be developed for all proposed prescribed burns and the Swiftcurrent/Park HQ tree removal programs

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Figure 1: Seral Stage Distribution

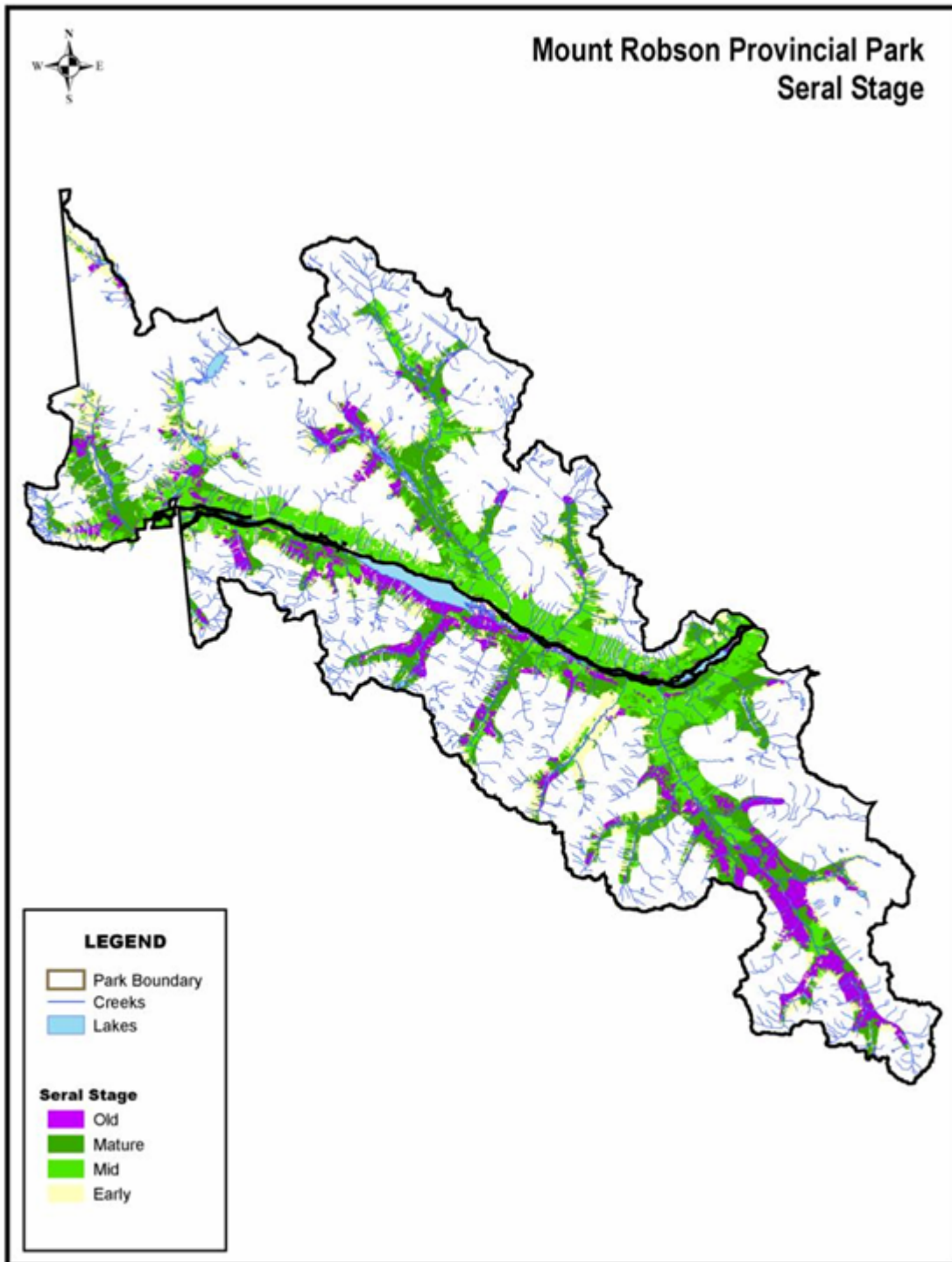


Figure 2: Mountain Pine Beetle Hazard

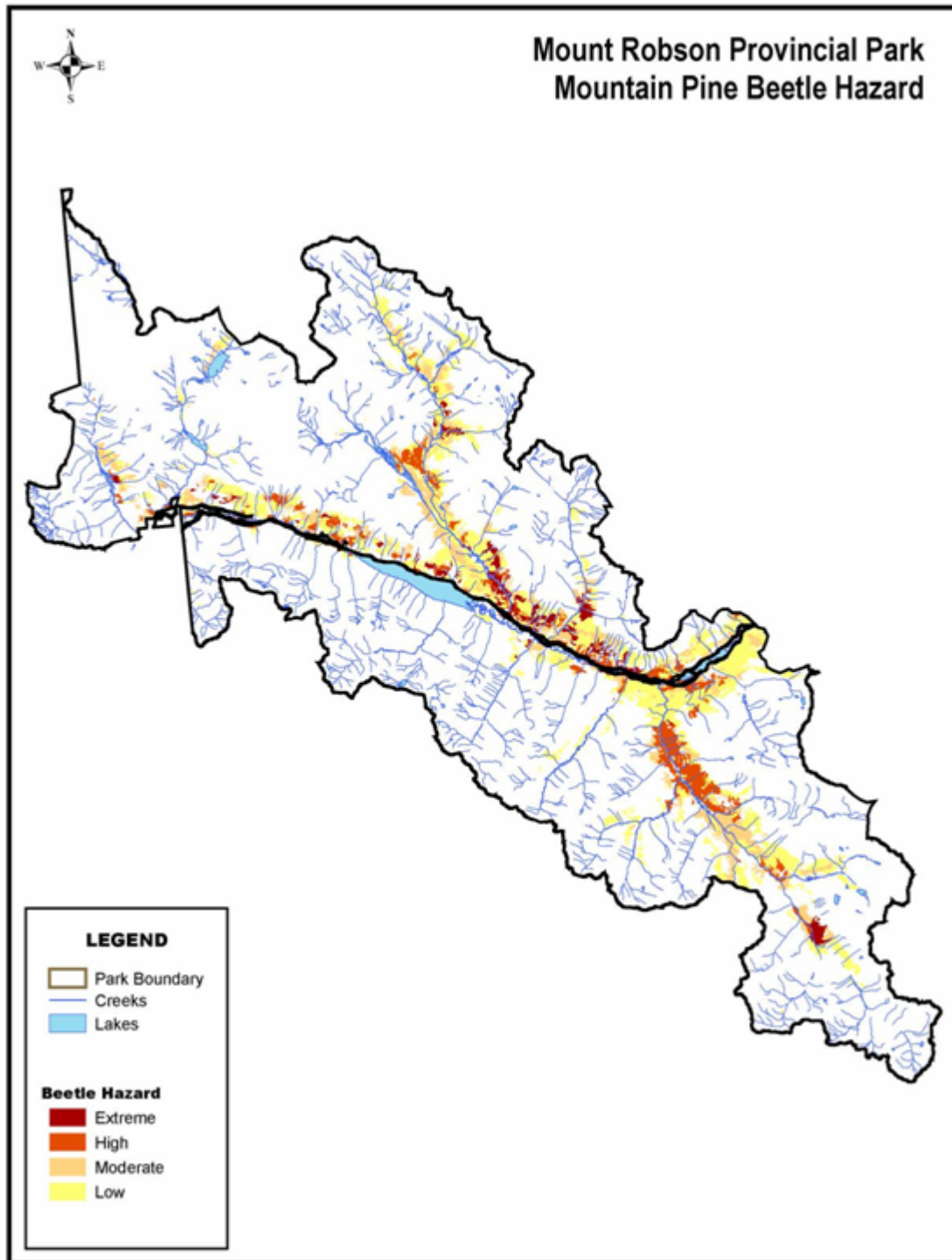


Figure 3: Mountain Pine Beetle Incidence

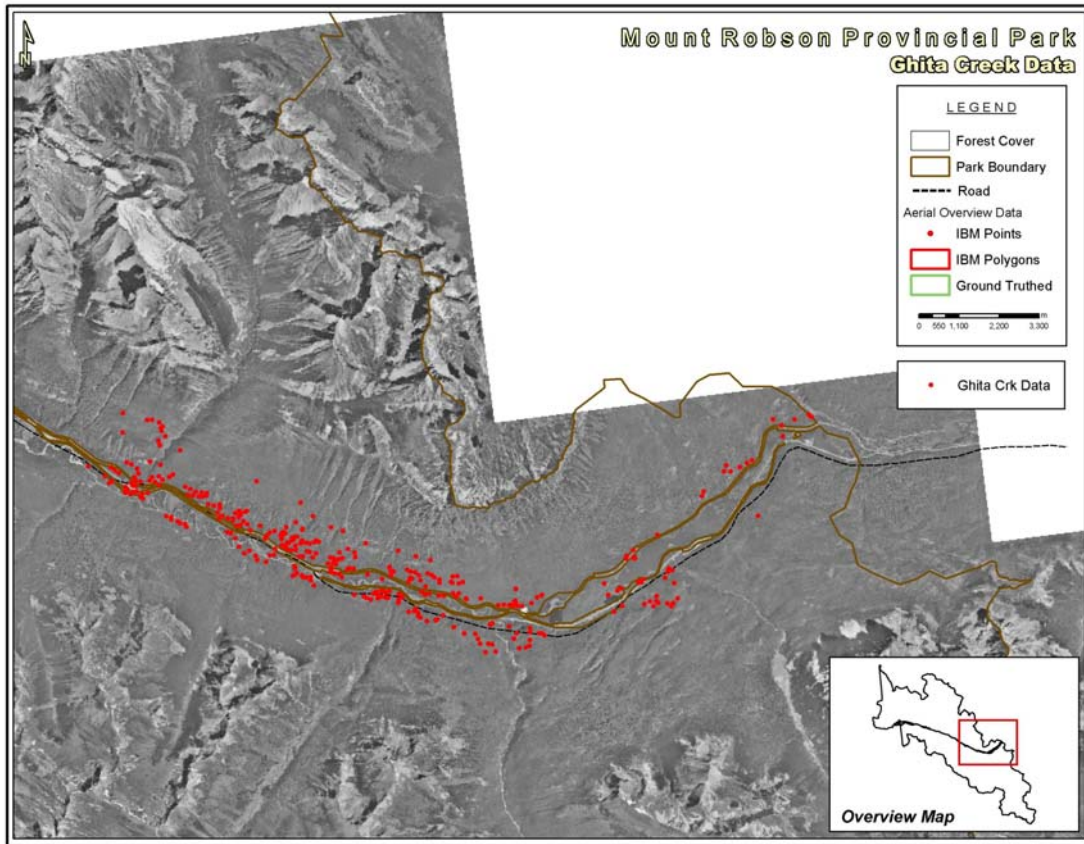


Figure 4: Fire Hazard

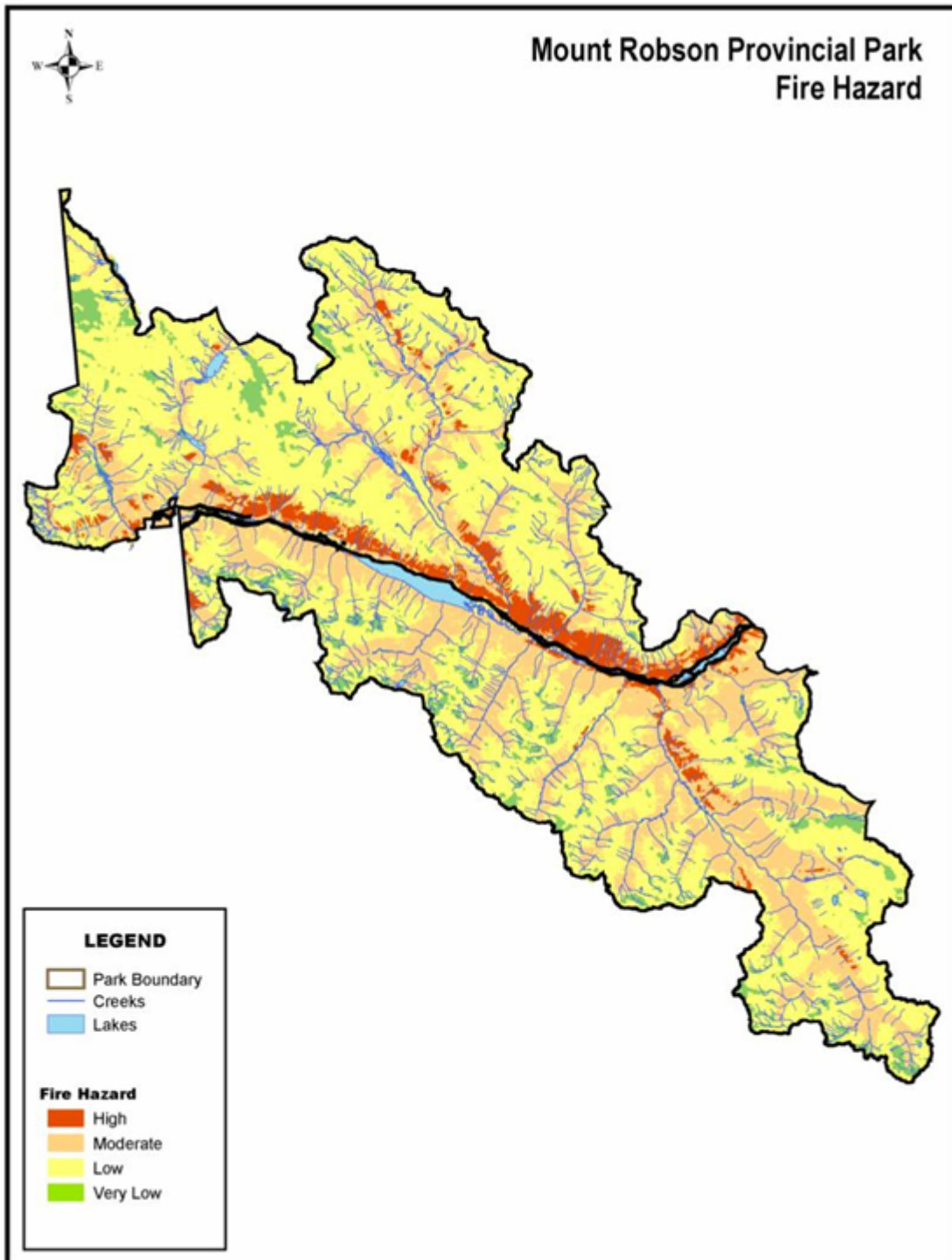


Figure 5: Ortho-photo Showing Proposed Treatment Zones

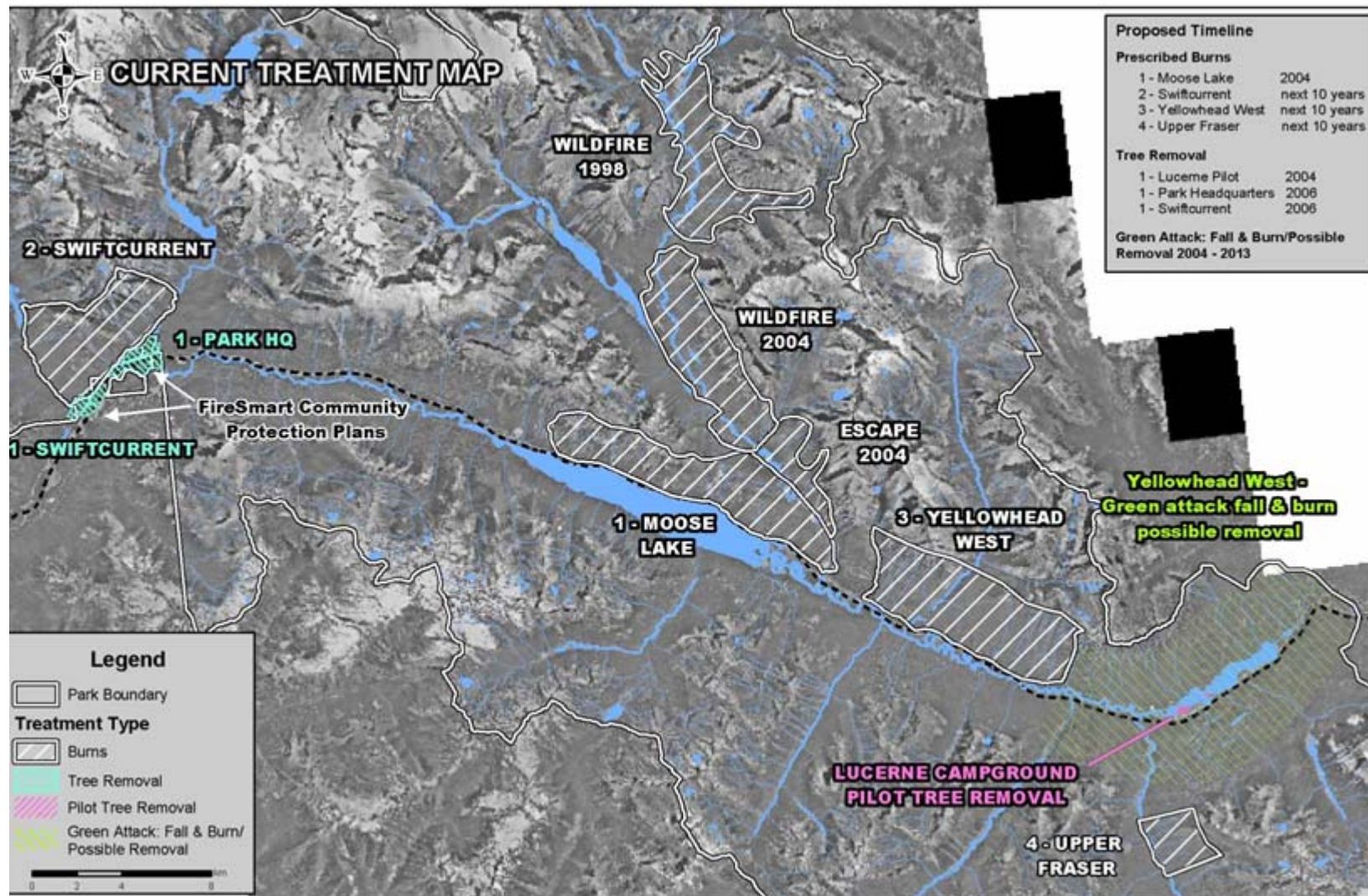


Figure 6: Ortho-photo Showing Proposed Treatment Zones in Swiftcurrent / Park Headquarters

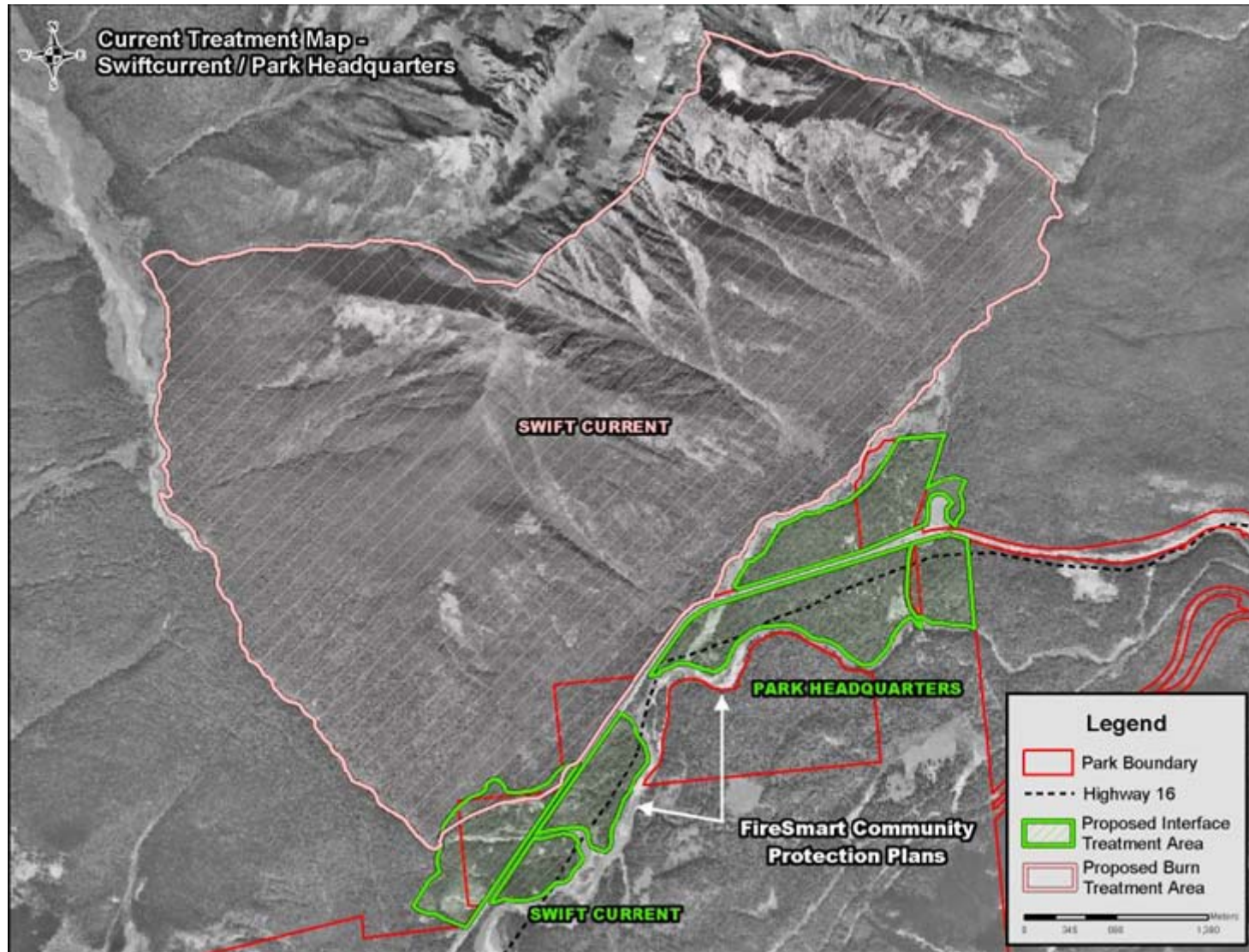
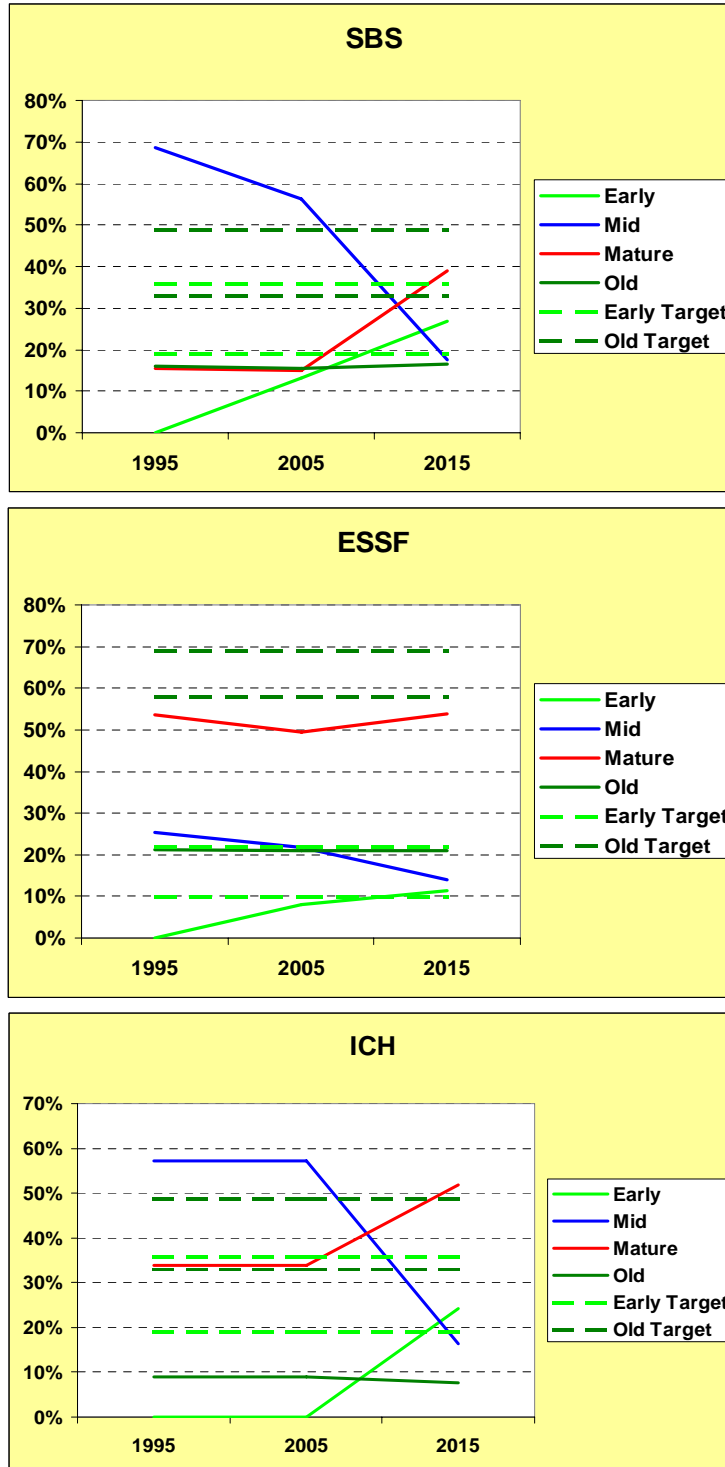


Figure 7: Preliminary Schedule of Treatments

	Year 1 04/05	Year 2 05/06	Year 3 06/07	Year 4 07/08	Year 5 08/09	Year 6 09/10	Year 7 10/11	Year 8 11/12	Year 9 12/13	Year 10 13/14
Single Tree Treatments	X	X	X	X	X	X	X	X	X	X
Prescribed Fire Moose Lake Swiftcurrent Yellowhead West Upper Fraser	Complete		X	X		X				
Tree Removal Lucerne Pilot Swiftcurrent/Park HQ Yellowhead West fuel break	Complete	X	X							

Figure 8: Changes in Seral Stage Area in Mount Robson Park for ESSF, SBS and ICH

Past (1995), current (2005) and projected (2015) areas for the early, mid, mature and old seral stages as defined in the Biodiversity Guidebook. Dashed lines show the target ranges for early and old seral stages as prescribed by DeLong (2002).



Appendix A
ECOSYSTEM MANAGEMENT PLAN
MONITORING OBJECTIVES

WILDFIRE MANAGEMENT

	Suppression Zone Action & extinguish all fires	Prescription Zone Wildfires and prescribed burns	Natural Zone Wildfires	Travel Corridor Zone Action and extinguish all fires
Objectives	<ol style="list-style-type: none"> 1. Prevent fire from destroying park structures, endangering visitors, escaping into adjacent jurisdictions & destroying rare Old Forest types 2. Reduce the probability of fire damage to facilities 3. In stands considered to pose a significant risk or hazard, lower the potential by altering surface fuel loading &/or manipulating stand structure 4. In conjunction with other agencies, assess & evaluate the most reliable & effective active management approaches 	<ol style="list-style-type: none"> 1. Improve monitoring of fire weather 2. Improve strategies for visitor safety 3. Develop an understanding of fire behaviour 4. Refine & develop a more comprehensive set of prescription guidelines 	<ol style="list-style-type: none"> 1. Obtain the ability to understand & model fire behaviour for the fuel types 2. Develop a better understanding of ecosystems 	<ol style="list-style-type: none"> 1. Obtain the ability to understand & model fire behaviour for the fuel types 2. Develop a better understanding of ecosystems
Action	<ol style="list-style-type: none"> 1. Contain, confine & control all fires within zone 2. Develop a fuel hazard reduction plan 3. Survey fuel loadings & establish fuel monitoring plots 4. Develop a program to assess the feasibility & efficiency of active management options 	<ol style="list-style-type: none"> 1. Establish & maintain a network of fire weather stations 2. Develop evacuation strategies 3. Conduct research-level prescribed burns 4. Develop prescriptions associated with fire behaviour patterns in the specific fuel types 	<ol style="list-style-type: none"> 1. Establish & maintain a network of fire weather stations 2. Conduct more research on specific vegetation communities and the role of fire in successional development 	<ol style="list-style-type: none"> 1. Establish & maintain a network of fire weather stations 2. Conduct more research on specific vegetation communities and the role of fire in successional development

	<u>Suppression Zone</u> Action & extinguish all fires	<u>Prescription Zone</u> Wildfires and prescribed burns	<u>Natural Zone</u> Wildfires	<u>Travel Corridor Zone</u> Action and extinguish all fires
Monitor (in established vegetation plots)	<ul style="list-style-type: none"> • Monitor fuel accumulation • Monitor changes to fuel loading and to ecosystem attributes (ie vegetation community, structural stage) where reactive management options are employed (i.e. STR or PB) 	<ul style="list-style-type: none"> • Annually collect weather information from stations. • Monitor changes to key ecosystem attributes (ie vegetation community, structural stage, invasive species) in all prescribed burns or wildfires permitted to burn at both the landscape (10 year interval) and stand level (years 1, 5, 10 post-management action). 	<ul style="list-style-type: none"> • Annually collect weather information from stations. • Monitor changes to key ecosystem attributes (ie vegetation community, structural stage, invasive species) in all wildfires 	<ul style="list-style-type: none"> • Annually collect weather information from stations. • Monitor changes to key ecosystem attributes (ie vegetation community, structural stage, invasive species) in all prescribed burns or wildfires permitted to burn at both the landscape (10 year) and stand level (years 1, 5, 10 post-management action)

STR – single tree removal
PB – prescribed burn

FOREST HEALTH

	<u>Suppression Zone</u> Monitor and undertake MPB management	<u>Prescription Zone</u> Prescribed fires and direct MPB action	<u>Natural Zone</u> Ecosystem processes can proceed relatively unconstrained	<u>Travel Corridor Zone</u> Monitor and undertake MPB management
Objectives	<ol style="list-style-type: none"> 1. Monitor outbreaks 2. Contain outbreaks which represent a significant threat to park values & management objectives 3. Decrease the probability of future outbreaks occurring in high hazard areas 	<ol style="list-style-type: none"> 1. Monitor outbreaks 2. Refine & reassess hazard ratings 3. Contain outbreaks which represent a significant threat to park values & management objectives 4. Decrease the probability of future outbreaks occurring in high hazard areas 5. Monitor & minimize negative impacts of prescribed burns on forest health 	<ol style="list-style-type: none"> 1. Monitor outbreaks 2. Refine & reassess hazard ratings 3. Contain outbreaks which represent a significant threat to park values & management objectives 4. Decrease the probability of future outbreaks occurring in high hazard areas 5. Monitor & minimize negative impacts of prescribed burns on forest health 	<ol style="list-style-type: none"> 1. Monitor outbreaks 2. Refine & reassess hazard ratings 3. Contain outbreaks which represent a significant threat to park values & management objectives 4. Decrease the probability of future outbreaks occurring in high hazard areas 5. Monitor & minimize negative impacts of prescribed burns on forest health
Action	<ol style="list-style-type: none"> 1. Conduct aerial & ground surveys 2. Single tree treatments or fall & burn, with or without pheromone baits 3. Thinning/silvicultural treatments to reduce stand susceptibility 	<ol style="list-style-type: none"> 1. Conduct aerial & ground surveys 2. Conduct age class, diameter & stand descriptive data to improve accuracy of future hazard assessment 3. Preferentially burn infested, high hazard stands 4. Use prescribed fire; single tree & thinning/silvicultural treatments 5. Conduct ground surveys & monitoring of insect populations in areas where management activities are being utilized (i.e PB and STR) 	<ol style="list-style-type: none"> 1. Conduct aerial & ground surveys 2. Conduct age class, diameter & stand descriptive data to improve accuracy of future hazard assessment 3. Preferentially burn infested, high hazard stands 4. Use prescribed fire; single tree & thinning/silvicultural treatments 5. Conduct ground surveys & monitoring of insect populations in burned areas 	<ol style="list-style-type: none"> 1. Conduct aerial & ground surveys 2. Conduct age class, diameter & stand descriptive data to improve accuracy of future hazard assessment 3. Preferentially burn infested, high hazard stands 4. Use single tree & thinning/silvicultural treatments. 5. Conduct ground surveys & monitoring of insect populations in areas where management activities are being utilized (i.e PB and STR)

	Suppression Zone Monitor and undertake MPB management	Prescription Zone Prescribed fires and direct MPB action	Natural Zone Ecosystem processes can proceed relatively unconstrained	Travel Corridor Zone Monitor and undertake MPB management
Monitor	<ul style="list-style-type: none"> • Conduct annual aerial beetle survey. • Conduct annual ground survey of red to green ratio to track expansion. • Monitor vegetation plots for changes to stand structure where active management strategies (ie. PB and STR) are utilized 	<ul style="list-style-type: none"> • Conduct annual aerial beetle survey. • Conduct annual ground survey of red to green ratio to track expansion. • Monitor vegetation plots for changes to stand structure where active management strategies (ie. PB and STR) are utilized or wildfires are permitted to burn 	<ul style="list-style-type: none"> • Conduct annual aerial beetle survey. • Conduct annual ground survey of red to green ratio to track expansion. • Monitor vegetation plots for changes to stand structure where active management strategies (ie. PB and STR) are utilized or wildfires are permitted to burn 	<ul style="list-style-type: none"> • Conduct annual aerial beetle survey. • Conduct annual ground survey of red to green ratio to track expansion. • Monitor vegetation plots for changes to stand structure where active management strategies (ie. PB and STR) are utilized

PB – prescribed burn
STR – single tree removal

BIODIVERSITY

	<u>Suppression Zone</u>	<u>Prescription Zone</u>	<u>Natural Zone</u>	<u>Travel Corridor Zone</u>
Value Emphasis	Recreation values and old forest stand retention	Caribou habitat, forest health and habitat management considerations for all forest management strategies (i.e. wildfire suppression and prescribed burning).	Preserving biodiversity and ecosystem processes with minimal management constraints.	Management and active control of all aspects to manage both human and wildlife use / safety within this corridor.
Objectives	Re-establish relatively Old Forest stands in ICH and SBS	<ol style="list-style-type: none"> 1. Maintain or increase ungulate summer range(SZ1) 2. Maintain or increase caribou winter range (SZ2) 3. Maintain or increase ungulate summer range (SZ3) 4. Maintain structural stages & deciduous/coniferous forests (SZ4) 	Maintain "natural" ratios of forest structural stages	<ol style="list-style-type: none"> 1. Determine the degree to which ROW's & natural ecosystems have been invaded by non-native vegetation 2. Reduce the potential for future invasion of non-native plant species
Action	Full fire suppression	<ol style="list-style-type: none"> 1. Maintain 60% in forest and 60% of forest as Old Growth 2. Convert 33% of subzone to Age Class 1 in next 150 years 3. Prescribed fire to create age & structural diversity (not to exceed 33% at any one time) 4. Permit wildfires to burn under prescription 	Monitor all wildfires & other disturbances, & update ecosystem inventory database	<ol style="list-style-type: none"> 1. Conduct an inventory to determine presence of non-native species 2. Develop guidelines for future development using native vegetation to replant disturbed areas

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Monitor (in established vegetation plots)	Analyze age class distribution at 10 year intervals	<ul style="list-style-type: none"> • Monitor changes to key ecosystem attributes (ie vegetation community, structural stage, invasive species) in all prescribed burns or wildfires permitted to burn (years 1, 5, and 10 post treatment) • Annually update the spatial distribution of managed disturbance. (ie prescribed burns or wildfires) 	<ul style="list-style-type: none"> • Annually update the spatial distribution of disturbance. • Monitor changes to key ecosystem attributes (ie vegetation community, structural stage, invasive species) in all significant disturbances • Analyze age class distribution at 10 year intervals 	<ul style="list-style-type: none"> • Monitor change in amount and type of invasive species on regular (3-4 year) interval • Monitor changes to key ecosystem attributes (ie vegetation community, structural stage, invasive species) in all prescribed burns (years 1, 5, and 10 post treatment)