

Vancouver Island Prescribed Burn Project Draft Objectives

Prepared for
Ministry of Water, Land, and Air Protection

Prepared by



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BACKGROUND

This project aims to identify sites where silvicultural or wildlife qualities could be enhanced through the use of prescribed fire. The project initially intended to identify 3-5 candidate blocks within or adjacent to known ungulate winter range on the Northeast coast of Vancouver Island between Campbell River and Woss. Burn plans for each block were to be generated.

Attempts to find suitable blocks proved difficult, as many of the licensees were reluctant to revisit the idea of prescribed fire, once a commonly used silvicultural tool. Discussions revealed that many of the licensees were still interested in the use of prescribed fire, but that current harvesting practices, namely the establishment of wildlife tree patches and retention harvests, economic, and public pressures outweighed any benefits potentially derived from the study.

Prescribed fire in the understory of selectively harvested forests has been studied in the Squamish Forest District and Mr. Julian Grzybowski was contacted to discuss how Squamish Forest District overcame some of the obstacles involved. Mr. Grzybowski suggested involving the staff at the Coastal Fire Centre in Parksville, BC for any fire related projects conducted on Vancouver Island. A meeting was arranged with the Coastal Fire Centre staff to discuss options for conducting prescribed burns on the island, as well as the creation of burn plans for each potential block. The Coastal Fire Centre is fully qualified to conduct prescribed burns in their entirety, with the added benefit of being responsible for potential mishaps. They are also able to prepare the required burn plans for each of the candidate blocks.

Several candidate areas have now been located. Staff at the Coastal Fire Centre will be responsible for the creation of the burn plans, as well as carrying out the burns. The role of Keystone Wildlife Research in this project thus shifted away from the creation of the burn plans to the refinement of the project objectives.

A literature review was carried out at the University of British Columbia that aimed to find information on the additional uses of prescribed fire in resource management. Areas researched included the use of prescribed fire for the enhancement of additional resource values (in addition to ungulate forage), the use of prescribed fire in harvested areas with residual overstory trees (such as wildlife tree patches or selectively harvested areas), and the effect of burn season and intensity on vegetation re-growth. Sources were restricted to forests similar to those found on Vancouver Island and coastal British Columbia, Washington, and Oregon.

INTRODUCTION

Prescribed fire has been used in forestry operations primarily as a silvicultural tool, geared towards the improvement of harvested areas for future tree growth. Logging slash created during harvesting is seen as a wildfire risk and a hindrance to planting operations once harvesting is complete (Nyberg and Janz 1990). Fire, in addition to lowering the amount of on-site slash, also reduces the abundance of resident natural vegetation, which has the potential of competing with regenerating conifers, thus reducing their productivity.

Research has shown that prescribed fire also has the potential of enhancing habitat for ungulate species, as fire can stimulate the growth of suitable forage plant species and improve the passage of wildlife through treated blocks due to reduced amounts of slash (Nyberg and Janz 1990).

The most important factor determining the effectiveness of fire as an enhancement tool is the intensity of the burn. Burn intensity is affected primarily by the season in which the burn is conducted, as well as site specific factors. The objectives of the study and the desired post-burn site features should be incorporated into the decision of how intense a fire is required.

BURN INTENSITY

Descriptions of the responses of wildlife (including plants) to fire are usually made with reference to the intensity of the fire. The majority of prescribed fire research associates burns conducted in the spring with a lighter intensity fire, and those conducted in the fall with a higher intensity fire (Beese *et al* 2001; Feller 1996; Peterson 1993; Beese 1992). In general, higher intensity fires result in greater vegetation, forest floor, and large woody debris consumption, increased mineral soil exposure, and a greater depth of burn (Beese *et al.* 2001; Feller 1996; Beese 1992; Nyberg and Janz 1990), all of which will impact future site characteristics, such as vegetation species composition and abundance, as well as residual site structure. Lighter intensity fires affect these same characteristics, but to a lesser extreme.

The general characteristics associated with each type of burn are summarised in Appendix 1. In some cases, reference was only made to features of high intensity burns.

The response of vegetation to fire is directly related to fire intensity. Intensity determines both the ability of on-site vegetation to recover from fire, as well as the amount of newly unvegetated area made available for colonisation by invading or suppressed plant species (Feller 1996; Beese 1992; Nyberg and Janz 1990). Regardless of the fire intensity, an initial reduction in the amount of on-site vegetation is to be expected. The responses of herbs and shrubs tend to differ with respect to fire intensity and are therefore discussed separately. A general trend emerging from the research has been that high intensity fires are good for vegetation control or reduction (Beese 1992), and for encouraging the development of herbs and mosses (Feller 1996), while light intensity fires stimulate shrub growth through vegetative sprouting (Feller 1996).

Herb Response

Vegetation recovery from fire can begin as soon as the first growing season following fire, and often consists of a dense coverage of herbs (Peterson 1993; Nyberg and Janz 1990; Dyrness 1973). The herbs are usually species typically associated with disturbed sites, especially those that have been burned. The species include fireweed (*Epilobium angustifolium*), pearly everlasting (*Anaphalis margaritacea*), wood groundsel (*Senecio sylvaticus*), and hairy cat's ear (*Hypochaeris radicata*) (Halpern and Spies 1995; Peterson 1993; Beese 1992; Dyrness 1973).

The effects of fire tend to last up to 5 years following treatment, within which time the largest changes to plant species composition and abundance occur (Knowe *et al.* 1997; Halpern and Spies 1995; Peterson 1993; Beese 1992; Dyrness 1973). These changes in species composition are likely due to the colonisation of the sites by the above mentioned herbs. Invasion by herbaceous species tends to be most common within the first 2 growing seasons following burning (Halpern and Spies 1995; Dyrness 1973), but have been known to last up to 4 years post-treatment (Dyrness 1973). By the 5th year however, resident forest species tend to regain dominance (Halpern and Spies 1995; Dyrness 1973).

Herbs exhibiting a decline following fire include sword fern (*Polystichum munitum*) (Dyrness 1973), Queen's cup (*Clintonia uniflora*), rattlesnake plantain (*Goodyera oblongifolia*), foamflower (*Tiarella trifoliata*), Prince's pine (*Chimaphila umbellata*), and wild ginger (*Asarum caudatum*) (Halpern and Spies 1995).

Shrub Response

Many shrubs have the ability to regenerate vegetatively following a disturbance such as fire, provided the fire is not too severe. Research has generally found that higher intensity fires are more likely to kill resident shrub species (Feller 1996; Peterson 1993; Beese 1992). High intensity fires burn hotter, thus reducing the amount of above-ground vegetation, and also burn to a greater soil depth, thus increasing the likelihood of damage to below ground reproductive / vegetative structures (Feller 1996; Peterson 1993; Beese 1992; Kauffman 1990).

The timing of the burn with respect to shrub phenology also affects shrub recovery. For example, studies have shown that shrub mortality increases and re-growth decreases if the burn occurs after a period of rapid shoot growth (Feller 1996; Kauffman 1990). This is largely due to the fact that the plants have used their stored carbon reserves for shoot growth, and have subsequently lost a large amount of above-ground biomass in the fire, leaving them with little to no ability to replenish their carbon reserves and re-grow new shoots.

Shrubs showing a decline in overall cover following fire include salal (*Gaultheria shallon*), some *Vaccinium* and rose species, and dull Oregon grape (*Mahonia nervosa*) (Halpern and Spies 1995; Beese 1992; Kauffman 1990; Dyrness 1973). These taxa have the ability to grow vegetatively following disturbance, but tend to recover more slowly.

Wildlife Response

Wildlife responses to fire are generally demonstrated through the production or destruction of suitable forage and / or habitat. As fire generally increases the abundance of herbaceous vegetation, this can be construed as a benefit to ungulates as many of the invading species are used as forage (Nyberg and Janz 1990). Some studies have also found that the nutritional quality of forage can be increased through burning (Feller 1982; Julian Grzybowski pers. comm.).

Large coarse woody debris, which provides habitat and forage sites for insects, birds, and small mammals, may be reduced by burning, if the fire is of a severe enough intensity (Feller 1982).

Some studies have reported positive responses to harvesting and burning by raptors and cavity nesters, largely due to the production of snags following fire (deCalesta 1990). Other studies have shown an increase in foraging potential for birds that feed on the ground or in the air (Feller 1982; Blake 1982).

Additional research is required to determine the effects of harvesting and prescribed burning on small mammals, birds, and other wildlife such as amphibians.

Site Specific Attributes

Site factors, specifically the moisture content of the forest floor and / or woody fuel greatly influence the intensity of burns (Beese 1992; Kauffman 1990). Water contained in surface organic layers and the underlying soil moderates the temperature of the burn, thus decreasing the depth of burn and minimising the potential damage to underground vegetative structures. Moist sites, especially those escaping serious disturbance have been shown to support nearly closed stands of the original vegetation, in this particular study they consisted of ferns, herbs, and low shrubs (Dyrness 1973).

Block attributes such as wildlife trees or selectively harvested areas affect the success of prescribed fires. The possibility of losing these attributes to a crown fire is high compared to prescribed burning of a clearcut block. Tree species not particularly well adapted to fire, such as Western yew (*Taxus brevifolia*) and Western redcedar (*Thuja plicata*) may also be killed by intense fires (Halpern and Spies 1995). Residual stand characteristics that determine the potential of a crown fire include the crown bulk density, properties of the surface fuel, and the crown base height (Graham *et al.* 1999).

Crown fires are influenced by the surface fire intensity (flame length), crown base height, and moisture content of live foliage (Graham *et al.* 1999). The spread of a crown fire is determined by the wind (direction, speed), slope of the block, species composition, and stand / crown structure (Graham *et al.* 1999; Kauffman and Martin 1989). All of these attributes would need careful consideration in order to protect residual overstory trees from sustaining damage during a fire.

OBJECTIVES

The general objectives for this project will attempt to incorporate the above information into the burning of the blocks selected for the trial. Depending on the features contained within each of the candidate blocks, a variety of treatments can be tried. Burning during different seasons could be a way of testing which fire intensity produces the best forage for the wildlife species of interest. If the objective is to enhance resident vegetation, a light, spring burn may be effective, whereas if a different vegetation composition is desired, a more intense burn may be required.

Depending on the level of retention maintained within the candidate blocks, a test of the ability of wildlife tree patches or selectively harvested areas to withstand prescribed burning can provide useful information regarding the feasibility of using these potentially incompatible forest management techniques (retention harvesting and prescribed burning) on the same sites.

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APPENDICES

Appendix 1. General features of different season / intensity of prescribed fires.

Light Intensity / Spring Burn	High Intensity / Fall Burn
Less reduction in resident species number and abundance	Encourages invading species (reduction in resident species)
Encourage shrub development	Encourage development of herbs and mosses
Less forest floor consumption	More forest floor consumption
Less mineral soil exposure	More mineral soil exposure
Little to no large woody debris consumption	More large woody debris consumption
Shallower depth of burn	Greater depth of burn
Fewer species lost (number and abundance)	More species lost (number and abundance)
Less shrub damage	More shrub damage
Encouraged <i>Epilobium angustifolium</i>	Encouraged <i>Epilobium angustifolium</i>
	Largely occupied by invading plant species
	Can reduce seedbank, plant propagules stored in soil
	Can shift species composition in future understory
	Best for slash reduction, and controlling / reducing on-site vegetation

Appendix 2. List of contacts.

<p>Project Leader Mr. Kim Brunt</p> <p>Wildlife Section, BC Environment Nanaimo, BC Phone: (250) 751-3213 e-mail: Kim.Brunt@gems9.gov.bc.ca</p>	
<p>Coastal Fire Centre Staff Mr. Phil Taudin-Chabot</p> <p>Manager – Coastal Fire Centre 665 Allsbrook Road Parksville, BC Phone: (250) 951-4208 e-mail: phil.taudinchabot@gems2.gov.bc.ca</p> <p>Mr. Darrell Orosz</p> <p>Staff Officer – Wildlands Operations Phone: (250) 951-4216 e-mail: darrell.oroze@gems7.gov.bc.ca</p>	<p>Protection Branch – Quinsam Fire Base Mr. Terry Preston</p> <p>Forest Protection Officer 905 Nursery Road Campbell River, BC Phone: (250) 286-6532 e-mail: terry.preston@gems3.gov.bc.ca</p> <p>Mr. Robert D. Fraser</p> <p>Forest Protection Assistant Phone: (250) 286-3795 e-mail: rob.fraser@gems4.gov.bc.ca</p>
<p>Mid Island Fire Zone – Port Alberni Mr. Bob Pfannenschmidt</p> <p>Forest Protection Officer c/o Coastal Fire Centre Phone: (250) 723-5124 e-mail: bob.pfannenschmidt@gems5.gov.bc.ca</p>	<p>Squamish Forest District Mr. Julian Grzybowski</p> <p>Small Business Officer 42000 Loggers Lane Squamish, BC Phone: (604) 898-2125 e-mail: Julian.Grzybowski@gems8.gov.bc.ca</p>

Appendix 3. List of additional burn contractors.

Coastal Fire Centre Staff (see above)	
Apex Enterprises Mr. Doug Harrison RR #3, Site 4, C-17 Nelson, BC Phone: (250) 825-9984	Tsuga Forestry Services Inc. Clearwater, BC Office PO Box 68 Clearwater, BC Phone: (250) 674-3647 e-mail: fire@tsuga.ca
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