WILDLIFE INFOMETRICS INC.

PRESCRIBED BURN ASSESSMENT

Cunningham Lake Prescribed Burn Site (east end): Vegetation/Burn Effectiveness Monitoring

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ABSTRACT

The BC Ministry of Environment conducted a prescribed burn on 2768 ha on the north side of Cunningham Lake in Rubyrock Lake Provincial Park. Initial reconnaissance of the burn area, completed in 2003, collected subjective data to describe the condition of the vegetation community, but was not an adequate intensity, nor was it complete enough to provide baseline data to evaluate the effectiveness of a burn treatment against. In the spring of 2008 just prior to the burn treatment a field visit was made to supplement the initial reconnaissance data by providing quantitative assessments of the cover of shrubs. The prescribed burn treatment was implemented in May 2008, and a post-treatment, revisiting the same plot locations as the pre-treatment assessments was completed in July 2008. The burn treatment was effective on 500 ha out 2768 ha, and only influenced 5 of the 14 plots that were established to monitor burn effectiveness. A reduction in the cover of shrubs, caused by the burn was evident, but there was no increase in the cover of herbs. The limited response observed in changes to the vegetation was a function of two factors: 1) burn intensity was low across the burn area having a limited influence on the vegetation community, and 2) the sampling procedures were not adequate to capture the range of variation experienced because of incomplete burning at the site. The burn treatment partially met ecological objectives of improving conditions for herbaceous growth, but greater value was gained as a tool for resource professionals to learn the procedures for implementing prescribed burns.

ACKNOWLEDGMENTS

Funding for this project was provided by the Stuart Nechako Ecosystem Restoration Committee. Andrea Heinrichs provided assistance with pre-treatment data collection and sorting out the logistics of getting to the site for the first field visit. Brady Nelless was key in coordinating all project activities ensuring support for the second field visit was organized.

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INTRODUCTION

In 1999 the Fort St. James Land and Resource Management Plan recommended the establishment of the Flemming Protected Area covering over 41-thousand hectares bound by Trembleur Lake to the north, Stuart Lake to the east and Cunningham Lake to the south. The Protected Area was subsequently converted to Park status and renamed Rubyrock Lake Provincial Park in 2001. The initial purpose for the designation of the park (as a protected area at the time) was to provide provincial representation of the Babine Upland Ecosection and to provide protection to unique regional features such as a Douglas-fir shoreline ecosystem found on Rubyrock Lake, and on herb-grassland meadows found north of Cunningham Lake.

Management of the park focuses on maintaining natural ecosystems (Province of BC 2005). In order to maintain some of the unique features identified in the area, reintroduction of fire was recommended to promote rejuvenation/recruitment and overall improved health of unique ecosystems (MacDonald 2003; Province of BC 2005). In 2003 initial steps were taken to utilize prescribed burning on the open herb-grassland meadows and surrounding forest types located north of Cunningham Lake. No further activities were undertaken until the winter/spring of 2007/08. A burn plan was finalized in May 2008, which stated the treatment objectives:

- Improve habitat for wildlife by stimulating vegetative regrowth through the removal of older, less palatable shrubs.
- Reduce litter layer depths that restrict forbs and grass production.
- Reduce overall stand densities to a level compatible with the site's nutrient and moisture regime.

Also in the spring of 2008, prior to leaf-out, a re-assessment of the vegetation at the plots established by MacDonald (2003) was completed with the intent to update and supplement the original observations (Sulyma 2008). The first field reconnaissance by MacDonald utilized a subjective procedure that did not allow for quantitative comparisons to be made between pre- and post-treatment conditions. The intent of the second visit was to update the species list and establish quantitative values that post-treatment data could be compared against.

The burn treatment was accomplished shortly after the vegetation re-assessment. It was implemented with an aerial ignition using an AID Machine and a Bell 206 helicopter. The burn plan area included 2768 ha of forest and meadow. Ignition was focused on 1120 ha in the burn plan area and was successful on approximately 500 ha (Mike Pritchard pers. com). Though 500 ha were ignited, it was estimated that fire intensity was hot enough on only 400 ha to cause mortality of aspen.

After vegetation green-up (in late July) a third ground inspection was undertaken to gather vegetation data that would enable a determination of burn effectiveness to be made. This comparison was relative to the species abundance and composition of the resulting vegetation community and the attainment of achieving the burn objectives. This report summarizes the findings observed in the vegetation response to prescribed burning. In addition, we noted and report on, several issues associated with monitoring that should be addressed for subsequent prescribed burning activities.

STUDY AREA

The study area was in Rubyrock Lake Provincial Park in the southwestern extent of the Fort St. James Forest District approximately 70 km northwest of the community of Fort St. James. The field activities were established at the west end on the north side of Cunningham Lake (Figure 1). The area that the plots were established falls within the intersection of three variants of the Sub-Boreal Spruce (SBS) biogeoclimatic zone (Anonymous 2006): the Dry Cool SBS (SBSdk) sub zone, the Stuart Dry Warm SBS (SBSdw3) subzone and the Babine Moist Cold SBS (SBSmc2) subzone. The general aspect of the burn was south to southwest though the terrain was rolling which resulted in some variability in aspect providing small patches of north or east aspects. Slopes throughout were varied and ranged from two percent to >60%. The elevation ranged from approximately 750 m above sea level (asl) on the north shore of Cunningham Lake to near 1000 m asl.

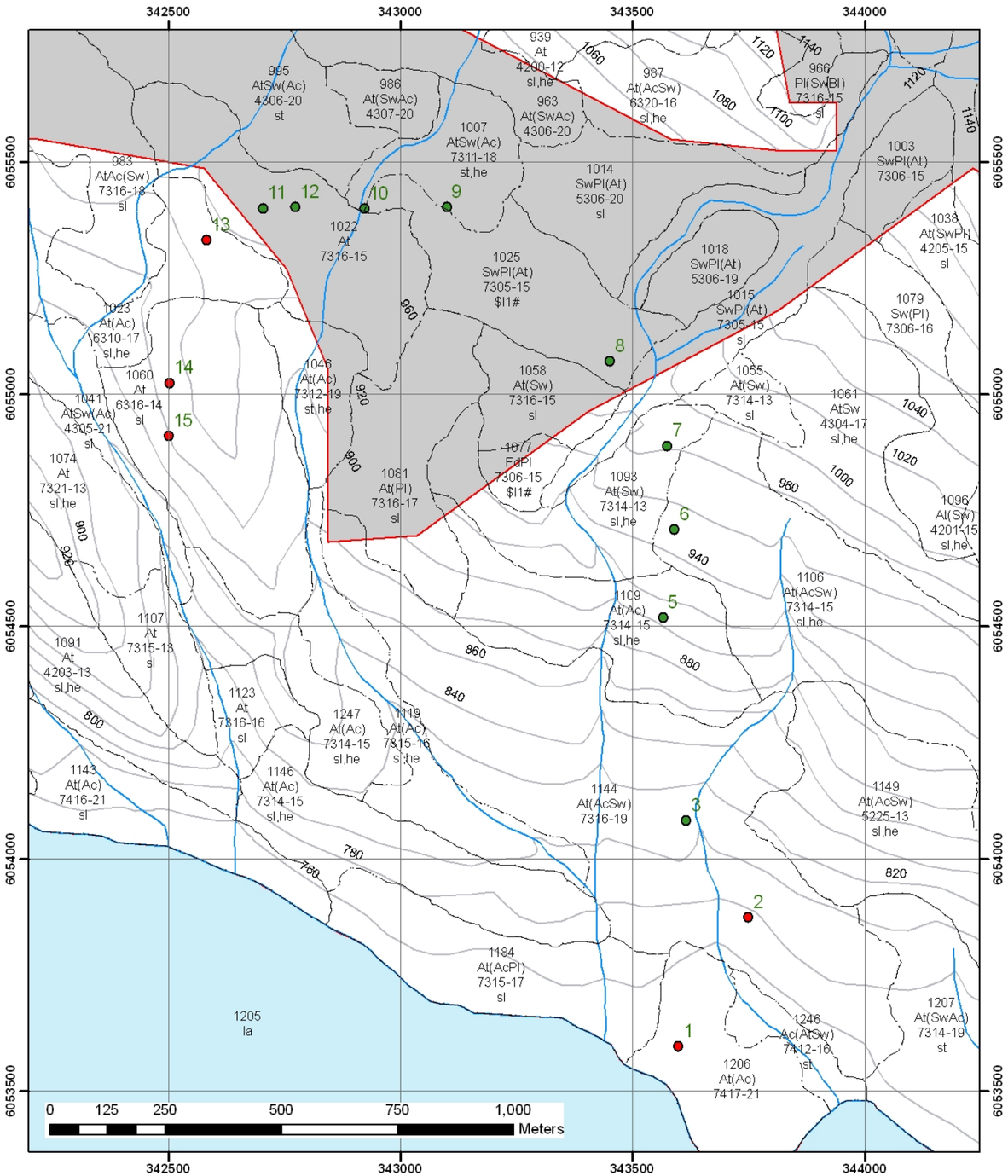
Forests in the vicinity of the established plots were dominated by trembling aspen (*Populus tremuloides*), though minor component of black cottonwood (*Populus balsamifera* spp. *trichocarpa*) and hybrid white spruce (*Picea glauca x engelmannii*) were also evident. The area was also characterized by many large openings (non-forested) representative of the Bluegrass – Slender Wheatgrass plant association. Other areas of the proposed burn along the north side of Cunningham Lake, but not at the location of the plots, have coniferous leading forest cover dominated by Douglas fir (*Pseudotsuga menziesii*). In addition, several rock outcrops have plant communities dominated by relatively old common juniper (*Juniperus communis*) which have attained a tree like form.

METHODS

A primary objective of the treatment was to stimulate vegetative re-growth and reduce the cover of less palatable shrubs for wildlife; thus, effectiveness monitoring was based on observing changes in the plant community species abundance and composition relative to treatment implementation. Initial vegetation evaluations were completed by MacDonald (2003) who developed partial species lists and expressed relative cover (high, medium, low) of species that he identified at 15 locations through the middle of the proposed burn area. In May 2008, prior to the burn treatment and before leaf-out, a field reconnaissance was undertaken to supplement the initial data collected by Macdonald (2003; Sulyma 2008). A final trip was made in July 2008 to evaluate the effects of the prescribed burning treatment on the vegetation community.

The treatment site has limited ground access. Durring summer months a boat can be used to cross Cunningham Lake (MacDonald 2003). For this project, the field crew flew from Fort St. James in a Bell 206 JetRanger. The drop site was a small opening approximately 400 m northwest of plot 1. The pick-up site was approximately 100 m east of plot 15.

Plot Location Map



Plot Coordinates

Plot	Easting	Northing
1	343598	6053596
2	343750	6053874
3	343615	6054082
5	343566	6054519
6	343590	6054709
7	343575	6054889
8	343451	6055072
9	343099	6055404
10	342922	6055401
11	342703	6055401
12	342773	6055404
13	342581	6055332
14	342503	6055025
15	342500	6054911

N

Not in Ignition Area

Burn Ignition Area

Plot without signs of burning

Signs of buning evident at plot

Cunningham Lake Prescribed Burn Site (east end)

Vegetation/Burn Effectiveness Monitoring Project

Date: November 14, 2008
Mapsheet: 93K011
UTM Zone 10
NAD83
Prepared by: R. Sulyma

Burn Site General Location Map

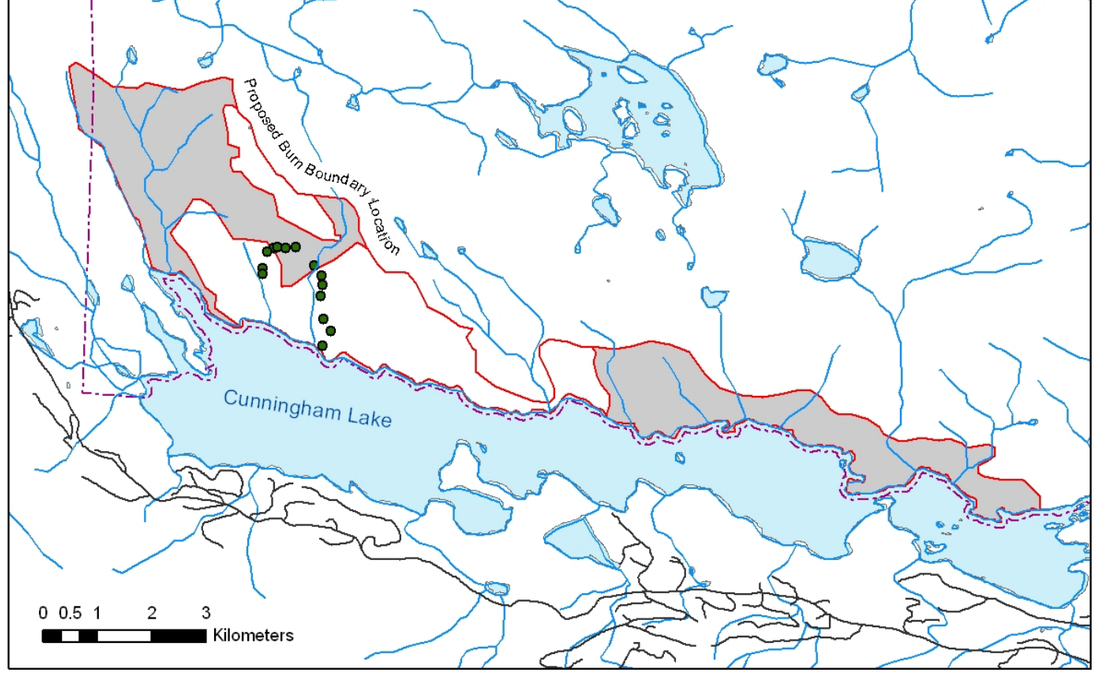


Figure 1. Location of the study area and the plot locations relative to Cunningham Lake. Shaded gray area represents the portion of the burn plan area where ignition was not attempted, plots identified with a red symbol indicate successful ignition was observed, plots marked with a green symbol showed no signs of burning.

Pre-Burn Assessment

Using coordinate information from MacDonald (2003), we navigated to the plot locations using a Garmin® Map76S (Garmin Ltd. Olathe, Kansas) and established a 3.99 m fixed radius plot. The plot centre was marked with a 55 cm long piece of rebar driven into the ground leaving approximately 25 cm exposed. A sketch map of the 3.99m radius plot was made to document the general location of key shrubs and other plot features. A Trimble GeoExplore XT ® (Trimble Navigation Limited, Sunnyvale, California) was used to collect the plot centre location and was differentially corrected to produce coordinates with sub-metre accuracy for future navigation purposes. At each plot a Ground Inspection Form[1] was completed following protocols for terrestrial vegetation data capture (Province of BC 1998). Estimates of the percent cover of woody shrubs were extrapolated from the presence of the leafless woody stem. General observations of coarse woody debris (CWD) were made. For analysis, plots were stratified into 3 stratums, those on sites with zonal conditions and an aspen overstory were classed as Stratum 1, open meadow areas were classed as Stratum 2, and coniferous forests were classed as Stratum 3. Data were entered into an Excel® (Microsoft Corporation, Redmond, Washington) spreadsheet and observations on general trends were made. The cover of woody shrubs was determine by summing the values recorded for: *Amelanchier alnifolia, Cornus stolonifera, Lonicera involucrata, Populus tremuloides, Ribes* species, *Rosa acicularis, Rubus idaeus, Rubus parviflorus*, and *Salix* species. All other species observed were recorded as herbs.

Post-Burn Assessment

In late July a site investigation was conducted to evaluate the response of the vegetation community to the burn treatment. Navigation to the plots was done with a Garmin® Map76S. Plot maps, developed in the pre-burn assessment were compared to the current conditions and updated. Vegetation cover was evaluated and recorded on Ground Inspection Forms and general observations of the burn effectiveness were made. Cover data was entered into the project Excel spreadsheet and was used to calculate basic statistics as well as complete pairwise comparisons using Minitab v11 (Minitab Inc., State College, Pennsylvania). Comparisons were made to determine the effects of the burn on changing community structure and to determine the utility of using pre-leafout estimations of vegetation cover to compare treatment results against.

RESULTS

Pre-Burn Assessment

Fourteen plots were established to evaluate the pre-burn vegetation community, nine were in Stratum 1, four were in Stratum 2 and one was in Stratum 3. One plot in Stratum 1 (plot 8) had too much snow to permit data collection; as a result, statistics for Stratum 1 were based

[1] http://ilmbwww.gov.bc.ca/risc/pubs/teecolo/fmdte/gif.htm (accessed May 8, 2008).

on eight plots. Field data summaries are provided in Appendix 1 and include values for terrain, stand, and vegetation conditions.

The average percent cover of woody shrubs tallied across all plots was 46.8% and the average percent cover of herbs was 22.3%. Comparisons of the vegetation between strata showed weak trends of higher cover of shrubs than herbs in all strata (Table 1). Stratum 2 had the greatest cover of woody shrubs (57.5%) and herbs (37.0%). The shrub cover in Stratum 1 was 41.4% and the herb cover was 15.8%. Stratum 3 was a plot in a coniferous stand; it had the lowest cover of both woody shrubs (5%) and herbs (3%).

Very general observations of CWD were made at each of the plots. Volumes were low (estimated to be <35 m^3 per plot) across the entire survey area and piece size was variable ranging from 12 to 45 cm. Coarse woody debris observed was generally class two or class three.

Post-Burn Assessment

Out of the 14 established plots, only five experienced some level of burning and this was generally low intensity. Of the five plots impacted by burning, four fell within Stratum 1 and one was in Stratum 2. The plot in Stratum 3 did not burn. None of the forested areas visited experienced crown fires and overall there was very little tree mortality observed while traversing between the plots.

The burn treatment appeared to reduce the percent cover of woody shrubs. Average pre-treatment cover of the five plots that were burned was 42.8% and the post treatment average was 17.0% (Table 1). The post treatment shrub cover varied from a high of 72% to a low of 0%. Herb cover was an opposite trend compared to the shrubs. Large increases of herbs were noted at the burned plots; however, a very similar increasing trend was also noted in plots that were not burned (Table 1). The low fire intensity did not result in an observable reduction in the volume of down woody debris. Blackening of woody debris was observed in a limited number of locations, but the fire was not hot enough to cause charring of the wood. The fire consumed the dried herbaceous and shrub mat on the forest floor that resulted from the previous seasons growth but there was little reduction to the organic layers. Blackening and consumption of some of the litter layer was observed but the organic mat was complete and intact at all plot locations.

Table 1. Summary of percent cover of woody shrubs and herbs by stratum for pre- and post-treatment assessments.

		Shrub Cover (%)			Herb Cover (%)		
Stratum[1]	(n)	Pre-burn	Post-burn	t (P) values	Pre-burn	Post-burn	t (P) values
1	5	36.6±38.4	45.0±35.9	--	13.6±17.29	59.8±20.0	--
2	3	73.3±17.6	32.7±17.8	--	33.3±11.5	67.7±25.5	--
3	1	5	3	--	0	0	--
1b	4	51.0±51.8	21.2±34.0	0.96(0.38)	18.5±20.2	57.7±23.1	2.56(0.051)
2b	1	10	0	--	48	93	--
1b+2b total	5	42.8±48.5	17.0±30.9	1.0(0.35)	24.4±21.9	64.8±25.5	2.69(0.31)

[1] the "b" modifier on the stratum label refers to plots, based on original stratum designations, that were subject to the prescribed burn.

DISCUSSION

The prescribed burning treatment was applied to address three objectives over the study area, two of which were focused on promoting herbaceous growth and one on reducing tree competition in grassland-herb meadow complexes. Due to the timing constraints associated with the burn implementation it was not possible to establish a direct measure of the herb abundance that could be used compare post-treatment results against. Estimations of herb cover were made during the spring field evaluation, however, the comparison of herb data in both the burned and unburned area showed the same result. Thus, it was determined that the observed effect in the herb layer was a function of an inability to evaluate herb cover in the spring and was not a result of the burn treatment.

The inability of monitoring the effects in the herb layer does not mean the fire had no effect on the ecology of the site. The spring data collection was not completed with the intent of supplementing herb cover data. The approach was to document shrub competition in order to determine if a reduction of shrub presence after prescribed burning was evident. The approach was based on the hypothesis that if shrub cover were reduced, the presence of pioneer herbs would increase, hence promoting herbaceous growth. A general trend of declining shrub cover after the burn was observed, which was in line with expectations, but due to large variability experienced over a small number of plots the confidence in the results was low. A redesign of the plot stratification and an increase in the plot sampling intensity in the burn area could alleviate the issue of low statistical confidence.

The fire did not appear to cause significant tree mortality in the vicinity of the plots. This was believe to be partly due to the low intensity of the burn and partly due to fact that aspen can take months, or even years to die after a burn and our visit was too soon to observe fire caused mortality (Brown and Debyle 1987; Howard 1996). Some mortality was noted in small diameter aspen, but this was localized to small patches usually adjacent to the grassland-herb meadows. Though unintentional, a low intensity burn approach may provide the most suitable procedure towards increasing the extent of the meadow ecosystems. Severe fire can promote intense suckering of aspen after a burn (Keyser et al. 2005). The lower severity burn in small diameter aspen reduces stem density and does not promote suckering, to the same extent as higher intensity burns, thus it provides the best situation to support the Bluegrass – Slender Wheatgrass plant association on the appropriate sites (Howard 1996; Keyser et al. 2005). Subsequent, and low intensity burns in the meadow areas should be considered to further support the objective of increasing the extent and reducing aspen encroachment on them.

The sample design founded by MacDonald was developed to traverse multiple vegetation types in the burn area. The vegetation types, though, were based on broad groupings. Finer resolution of the stratification would improve the ability to address variation observed in treatment implementation. For instance, stratification that was sensitive to the elevation gradient in conjunction with the vegetation type would have given more precise units relative to both expectations and outcomes of the burn implementation. Refined stratification will improve the ability to develop a sample plan that addresses site level variation of indicators that a monitoring plan is based on. Fifteen permanent plots were originally established to monitoring changes in the vegetation community. Out of the 15, only five were within the

ignition area. Greater intensity sampling must be undertaken in each stratum to produce meaningful monitoring data. A suitable target would be to sample at an intensity that produces a statistically valid data set (for example set a target standard error for the mean cover of indicator plants) that does not rely on the re-establishment of permanent sample plots.

In a project of this magnitude, relative to the size of the treatment area and the ecological variability encountered, precise definition of the objectives improves the ability to attain and to measure successful treatment implementation (Elzinga et al. 2001). The burn plan provided three objectives relative to plant community development and wildlife habitat management. Unwritten though was a simple objective focused on implementing a successful burn, where successful was defined as attaining ignition on some portion of the burn area and not experiencing unplanned losses. Prescribed burning has had limited use over the last decade. This project provided a valuable learning tool for a large group of resource professionals including park managers, fire specialists, ecologists and administrators. Though desired outcomes may have included a higher severity burn covering a broader extent of the burn plan area, and a more complete monitoring process, it did provided a valuable learning tool that can be built on for subsequent activities at this site and others in the region.

LITERATURE CITED

Anonymous. 2006. Predictive ecosystem mapping of the Prince George and Fort St. James Forest Districts: Year 2 Interim Report. Timberline Forest Inventory Consultants Ltd. Prince George, BC. 38pp.

Brown, J.K., and Debyle, N.V. 1987. Fire damage, mortality, and suckering in aspen. Canadian Journal of Forest Research 17: 1100-1109.

Elzinga, C.L., Salzer, D.W., Willoughby, J.W., and Gibbs, J.P. 2001. Monitoring Plant and Animal Populations. Blackwell Science, Malden, Massachusetts.

Howard, J.L. 1996. Populus tremuloides. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available from http://www.fs.fed.us/database/feis/, accessed December 4, 2008.

Keyser, T.L., Smith, F.W., and Shepperd, W.D. 2005. Trembling aspen response to a mixed-severity wildfire in the Black Hills, Douth Dakota, USA. Canadian Journal of Forest Research 35: 2679-2684.

MacDonald, R. 2003. Field observation - Cunningham Lake prescribed burn site (east end) Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Parks and Protected Areas. Prince George, BC. 61pp.

Province of BC. 1998. Field manual for describing terrestrial ecosystems. Resource Inventory Branch BC Ministry of Environment, Lands and Parks and Research Branch BC Ministry of Forests. Land Management Handbook 25. Victoria, BC. (Paginated in sections).

Province of BC. 2005. Rubyrock Lake Provincial Park purpose statement and zoning plan. BC Ministry of Environment, Environmental Stewardship Division, BC Parks. Prince George, BC. Available from http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/rubyrock_lake/rubyrock_lake_ps.html.

Sulyma, R. 2008. Cunningham Lake prescribed burn site (east end): pre-treatment vegetation/burn effectiveness monitoring data. Wildlife Infometrics Inc. Wildlife Infometrics Report No. 280. Mackenzie, BC.

APPENDIX 1

Records for the site data, front side of GIF, for each plot.

Plot	UTM zone	North	Easting	General Aspect	Aspect: deg	Elevation	Slope	SMR	SNR	Meso Slope Position	Drainage	Texture	Humus Form	Oganic thickness	Root Restricting Layer	Coarse Fragment Content	Terrain Texture	Surfacial Material	BGC Unit	Site Series
1	10	6053595	343596	S	190	756	2	4	D	lower	mod well	loamy	moder	<40	none	20-35		Fg	SBSdk	01
2	10	6053878	343748	S	217	793	17	4	D	mid	well	loamy	moder	<40	none	20-35	s	Fg	SBSdk	01
3	10	6054076	343611	S	200	820	11	5	D	mid	mod well	loamy	moder	<40	none	<20	x	Fg	SBSdk	01
5	10	6054521	343563	S	200	918	27	3/4	D	upper	well	clayey	moder	<40	none	<20	c	Fg	SBSdw3	00
6	10	6054704	343591	S	204	958	27	4	D	upper	well	clayey	moder	<40	none	<20	zc	Fg	SBSdw3	01
7	10	6054890	343574	S	210	981	25	3/4	D	mid	mod well	clayey	moder	<40	none	<20		Fg	SBSdw3	00
8	10	6055063	343445	S	220	998	15	xx[1]	xx	upper	xx	xx	xx	xx	xx	xx	xx	xx	SBSmc2	xx
9	10	6055404	343099	SW	245	991	8	5	C	mid	imperfectly	clayey	mor	<40	none	<20		Fg	SBSmc2	08
10	10	6055397	342918	SW	245	981	58	4	D	mid	imperfectly	clayey	moder	<40	none	<20	c	Fg	SBSmc2	01
11	10	6055404	342772	S	220	952	8	3/4	D	mid	mod well	clayey	moder	<40	none	<20	zc	Fg	SBSmc2	00
12	10	6055396	342699	S	220	964	5	4	D	mid	mod well	clayey	moder	<40	none	<20	zc	Fg	SBSmc2	01
13	10	6055334	342580	S	225	922	23	3/4	D	mid	imperfectly	clayey	moder	<40	none	<20	zc	Fg	SBSmc2	00
14	10	6055026	342500	SW	240	914	38	3	C	mid	mod well	clayey	moder	<40	none	<20	zc	Fg	SBSdk	01
15	10	6054911	342500	SW	210	898	44	3	C	mid	well	clayey	moder	<40	none	<20	zc	Fg	SBSdk	01

[1] xx represents that no data was collected for this feature.

Records for stand characterization observation and for coarse woody debris observations

Plot	Stratum	Structural Stage	Crown Closure	Tree Cover Label	Stand Comments	Ave DBH (cm)	DBH Range	Est Tree Ht (m)	CWD Vol	CWD Dominant Classes	CWD Size (diam - cm)
1	1	6	45	At10		28	20-38	25	low	2, 3	30
2	1	6	15	At10(Sx)	Open At	49	35-50	25	low	3	40
3	1	6	10	At10(Sx)	Sx ingress	40	27-49	23	low	3	45
5	2	3b	0	n/a	Opening				n/a		
6	1	5	35	At10	Mixed Sizes	18	15-40	16	low	3	18
7	2	3b	0	n/a	Opening				n/a		
8	1	5	45	At10(Sx)	1500sph			16	xx		
9	3	6	60	Sx8Bl1Ac1	2000 sph	30	21-65	28	low	1,2,3	35
10	1	6	25	At10	1600sph	20	30-30	25	low	3	20
11	2	3b	15	At9Sx1		20	10-25	25	low	3	25
12	1	6	40	At10		28	26-34	24	low	2, 3	22
13	2	2a	0	n/a	Opening				n/a		
14	1	5	50	At10	Open understory	15	11-21	15	low	3	15
15	1	5	55	At10(Sx)		15	12-19.5	15	low	2	12

Records for vegetation data, back side of GIF, for each plot. Shaded (green) rows represent information from MacDonald (2003) where PL = plentiful, FR = frequent, FW = few and SC = scarce. The unshaded row are pre-treatment data and the brown shading represents values observed after treatment implementation .

Plot	Stratum	% Cover Woody Shrubs	% Cover Herbs	Est. Species Pct Cover: *Actaea rubra*	*Agropyron trachucaulum*	*Amelanchier alnifolia*	*Aster* spp.	*Aster conspicuus*	*Athyrium filix-femina*	*Bromus* spp	*Calamagrostis canadensis*	*Cornus stolonifera*	*Delphinium glaucum*	*Elymus* spp	*Epilobium angustifolium*	*Equisetum arvens*	*Galium boreale*	*Gymnocarpium dryopteris*	*Heracleum lanatum*	*Lathyrus nevadensis*	*Lonicera involucrata*	*Maianthemum canadense*	*Populus tremuloides*	*Ribes* spp.	*Rosa acicularis*	*Rubus idaeus*	*Rubus parviflrus*	*Salix* spp.	*Smilacina racemosa*	*Spirea betulifolia*	*Streptopus amplexifolius*	*Symphocarpos albus*	*Thalictrum occidnetale*	*Urtica dioica*	*Viburnmum edule*
1	1	45	25								2				10				10		20				30		20	5			15	25			
															PL				FR		PL						PL			FR	FR	FW			FR
	1p	10	60					8							10				2	20					5	1			1		4	3	15		
2	1	60	20									10									40				8			3			Y	15			3
	1p	70	30				2	3							5				2	5	60				6						10	5			1
3	1	75	20									10								5	50						10					10	1		20
	1	60	40					10				5			10		5		5	5	45										15		3		10
3	2	65	35								30										5				20						10	50			
	2	35	80				2			50					3				6	5					5	15						15	7	5	
6	1	40	20								5								7								40				10				
	1	70	25					5			1		5		3				10	10					5		60				15		3		
7	2	60	30								10				10				15				5				55								
	2	30	70				5						5		8				20							5	25						15	10	
8	1	xx	xx																																
	1		80				7						10		5				15	10									1		20		10		
9	3	5	3																																5
		n/a	n/a						FW									FW	SC					FR											
	3	8	5	1												3			2		1	0.5									1				2
10	1	30	20																		7						10	3			1				7
	1	80	35												5				10	3	5						75	5	1		10		5		
11	2	90	20				5				5				10										20							70			
	2	50	75				8	5							8					8					8						8	45	5		
12	1	15	50				5				5				10					5					5						15	10			
	1	15	80				5								15				4	10					5				5		35	10	8		
13	2	10	80												20				8						10						20				
					FR		FR				FR				PL				FW						PL						FR				
	2b		100												50				8												25		5	5	
14	1	3	50				5								10					5					1						15				
	1b	1	80	5			5								5				5	8					1						45		10		
15	1	10	45											2					Y						5						Y	5			
	1b	5	60			1		2						5	5				2	15							4				25		5		