GROUSE MOUNTAIN
POST BURN VEGETATION INVENTORY

September 2002

Prepared by: Valerie Veenstra, B.Sc.
Sybille Haeussler, M.Sc., R.P.F.
Skeena Forestry Consultants, Smithers, B.C.
skeena@bulkley.net

Prepared for: Jane Woods
Bulkley Forest District

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

On May 15, 2002, a burn was carried out on Grouse Mountain by Northwest Fire Centre personnel. This burn was planned by the Bulkley Forest District Range section and included a 1 ha monitoring plot that was established in the summer of 2002 by Oikos Ecological Services Ltd as part of a grassland restoration project in the Prince Rupert Forest Region (Oikos 2002). After the burn, the 1 ha area was resampled. This report discusses first growing season impacts of the burn on the vegetation community and makes some recommendations for the site.

2.0 METHODS

2.1 Data Collection

One week after the burn (May 24 and 27, 2002), preliminary sampling was carried out. Daubenmire plots were relocated, photographed, and assessed for the extent and severity of burning (see Appendix II, Burn Extent and Severity). Five aspen plots were established, in which 20 – 30 aspen trees each were flagged, and the severity of the burn on each tree was noted to allow aspen mortality to be monitored. GPS locations were recorded for each aspen sample plot (see Appendix I).

In August 2002, the site was resampled with the same methods used in August 2001 (Oikos 2002). The baseline runs at 335° from the SE corner. Transects start at 1m along the baseline, and are at 10m intervals. They run perpendicular to the baseline at 165°. Each Daubenmire plot is marked with 2 corner nails. The marking nails for the following Daubenmire plots were not relocated: 4-2, 4-3, 4-7 and 6-6. In those cases, the Daubenmire frame was put down at the *x* metre mark of the transect where the nail should have been. The following plots had only 1 nail: 2-5, 3-6, 3-7, 5-9, and 10-8. The frame was put down to the left or right of the nail, as indicated in the field notes It should also be noted that on the field notes only, strata 1 and 3 were reversed in 2002 compared to 2001. That is, on the 2002 field notes and raw digital data (not in the report), stratum 1 refers to steppe vegetation, while stratum 3 is shrub vegetation.

Aspen plots, set up May 2002, were reassessed on August 2, 2002 using standard vigour codes (RIC 1998; see Appendix II, Aspen Vigour Data).

A permanent sample plot was set up 44 m at bearing 318° from the SE corner of the 1 ha monitoring plot (start of baseline). A 1m length of rebar with orange flagging was located near a small bedrock outcrop at plot centre. A full ecoplot (FS882 form) was completed.

Five photos each were taken at the SE corner post, and at the beginning of transects 4 and 10: looking down at the post from chest height, facing north, facing east, facing south, and facing west (see Appendix II). Similar photos were also taken at the permanent ecoplot, along with a few snapshots. There are also photos of aspen plots 1, 4 and 5, and some showing lightly and severely burned aspen stems.

2.2 Data Analysis

Vegetation response to the burn was assessed by comparing post-burn (2002) Daubenmire and line intercept data to pre-burn (2001) data. Unfortunately, there is no true experimental control for monitoring vegetation response to the fire because there were relatively few unburned Daubenmire plots or line sections within the monitoring area, and most of these were located either on bedrock outcrops or within the aspen forest (strata 2 and 4). Changes observed between 2001 and 2002 could therefore reflect factors other than the prescribed burn such as differences in weather patterns, animal disturbance or increased maturity of the plants.

Each of the 100 Daubenmire plots sampled in both 2001 and 2002 was assigned a stratum (2001), and a burn severity (May 2002), as described above. Results from 2002 were compared with the 2001 data in three ways: all data combined, separately by stratum, and separately by burn intensity.

The permanent sample plot data were entered into the V-PRO database programme and sent to Karen McKeown at the Prince Rupert Regional Office for inclusion in the provincial ecosystem database.

3.0 BURN STATUS

Burn intensity varied over the 1 ha sample site. 25 Daubenmire plots were unburned or very lightly burned, 60 were lightly burned (grassfire intensity), and 15 were severely burned (wood, litter and humus consumed and reduced to ash). The extent and severity of the burn varied with stratum (see Table 1 and Figure 1). Stratum 2, the bedrock outcrops, had a mean burn severity of 0.11 (0 being unburned and 2 being severely burned), with only 3% of the surface area burned. At the other end of the spectrum, stratum 3, the shrub area, had a mean burn severity of 1.20 with 76% of the area burned.

Table 1: Mean burn severity by stratum, as observed in 100 Daubenmire plots.

Stratum	Mean burn severity	Mean percent burned
1 – Shrub	1.20	75.69
2 – Bedrock outcrop	0.11	3.33
3 – Steppe	0.87	49.00
4 – Aspen stand	1.15	64.24

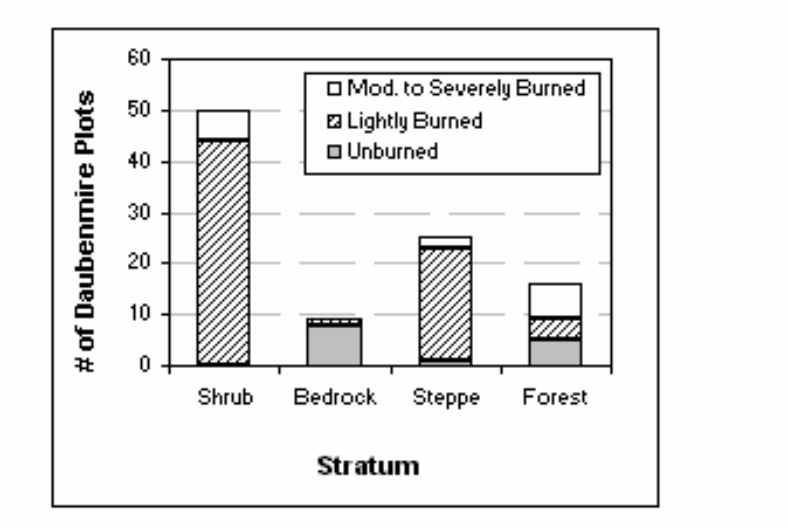

Figure 1: Distribution of burn severities by stratum.

Locations of the five aspen sample plots surrounding the 1 ha monitoring plot are shown on the map in Appendix 1. Within the aspen forest surrounding the grassland, patches of unburned trees could be found, as well as patches of lightly or severely burned trees, but it was difficult to find patches within which all three burn severity possibilities were present.

4.0 VEGETATION RESPONSE

4.1 Line intercepts

In general, both shrub and tree cover decreased after the burn (Table 2.). The decrease in shrub cover was due to top-killing by the fire. Vigourous resprouting was observed, and it can be assumed, based on literature summarized in Oikos (2002), that shrub cover will reach and possibly exceed pre-burn levels within a few years.

One species, *Rosa acicularis*, increased from 18 to 26% cover in the first growing season. This is a potential concern for range, since prickly rose is not a forage species.

Table 2: Mean tree/shrub cover in 2001 and 2002, as calculated from line intercept data. Species are listed in order of mean cover (2001).

Scientific Name	Common Name	Mean Cover 2001	Mean Cover 2002
Amelanchier alnifolia	saskatoon	41	33
Rosa acicularis	prickly rose	18	26
Symphoricarpos albus	snowberry	16	5
Populus tremuloides	trembling aspen	13	12
Salix spp.	willow	4	0.2
Picea engelmannii	Engelmann spruce	3	2
Acer glabrum	Douglas maple	2	1
Prunus pensylvanica	pin cherry	2	1
Prunus virginiana	choke cherry	1	1
Shepherdia canadensis	soopolallie	0.8	0.3
Rubus parviflorus	thimbleberry	0.4	0.4
Rubus idaeus	red raspberry	0.06	0.4
Viburnum edule	highbush cranberry	0.01	0.01
Pinus contorta	lodgepole pine	-	0.4

4.2 Daubenmire plots

4.2.1 All plots

Table 3 shows the change in mean cover and presence of the 10 most abundant species in 2001. Vegetation response was consistent with the literature (Oikos 2002). Shrub cover in the plots responded similarly to the line intercept data; however, the prickly rose did not show as dramatic an increase as in the line intercept data. Showy aster had the greatest increase of all species, although it was present in 2 fewer plots than pre-burn. The other major forbs (meadowrue, peavine, bedstraw and paintbrush) also increased in cover following the fire. As expected, Kentucky bluegrass cover decreased (from 5% to 2% cover) because it was in an early vegetative stage at the time of the fire. This is the time when fire is most damaging to this cool-season grass. However, the rhizomes likely survived, and in the absence of annual burning it can be expected that the species will return to pre-fire levels in 1 to 3 years (Oikos 2002).

Table 3: Mean cover and presence of ten most common species found in 2001 Daubenmire plots (P=presence). Values for both 2001 and 2002 are shown.

Scientific Name	Common Name	2001		2002	
		Mean Cover	P	Mean Cover	P
Aster conspicuus	showy aster	21.25	75	32.55	73
Amelanchier alnifolia	saskatoon	15.74	54	8.77	42
Rosa acicularis	prickly rose	7.12	57	7.60	58
Symphoricarpos albus	snowberry	6.89	57	2.29	46
Thalictrum occidentale	western meadowrue	5.86	64	7.84	68
Poa pratensis	Kentucky bluegrass	5.03	51	2.15	39
Lathyrus spp.	peavine	3.98	72	6.62	68
Galium boreale	northern bedstraw	2.39	71	3.52	77
Populus tremuloides	trembling aspen	1.10	5	0.00	0
Castilleja miniata	common red paintbrush	1.00	20	1.78	26

4.2.2 By stratum

The saskatoon – slender wheatgrass shrub stratum was lightly burned, with an average burn severity of 1.20. Results for this stratum (Table 4) are comparable to the results for the entire 100 plots, largely because the shrub stratum occurs in 50 of the 100 Daubenmire plots. Soopolallie appears to be intolerant to (or slow to recover after) fire.

Table 4: Stratum 1 – shrub.

Scientific Name	Common Name	2001		2002	
		Mean Cover	P	Mean Cover	P
Aster conspicuus	showy aster	27.02	92	46.26	92
Amelanchier alnifolia	saskatoon	20.90	72	11.94	58
Symphoricarpos albus	snowberry	9.39	70	2.96	52
Thalictrum occidentale	western meadowrue	8.42	86	9.95	88
Rosa acicularis	prickly rose	7.90	62	8.32	66
Lathyrus spp.	peavine	4.60	78	6.56	68
Poa pratensis	Kentucky bluegrass	4.01	58	1.69	42
Galium boreale	northern bedstraw	2.42	84	4.44	86
Castilleja miniata	common red paintbrush	1.65	26	2.66	32
Shepherdia canadensis	soopolallie	1.50	2	0.10	2

The bedrock outcrop stratum was mostly unburned, with an average burn severity of 0.11. Thus, the burn did not heavily influence vegetation changes in this stratum. However, some species, such as blue clematis and saskatoon, were not rooted within the plot itself and so may have been influenced by adjacent burned areas. The rock outcrops were often small unburned areas within a larger matrix of burned shrub and steppe areas.

Table 5: Stratum 2 – bedrock outcrop.

Scientific Name	Common Name	2001		2002	
		Mean Cover	P	Mean Cover	P
-	crustose lichens	10.81	89	18.89	56
Amelanchier alnifolia	saskatoon	7.78	44	3.01	33
Galium boreale	northern bedstraw	4.78	22	1.24	44
Rubus idaeus	red raspberry	3.44	11	3.33	11
-	mosses	2.52	44	4.02	89
Clematis occidentalis ssp. grosseserrata	blue clematis	2.22	11	0.00	0
Rosa acicularis	prickly rose	1.69	56	2.22	44
Tortula ruralis	sidewalk moss	1.67	22	0.57	33
Fragaria virginiana	wild strawberry	1.50	78	2.00	78
Selaginella densa	compact selaginella	1.33	22	1.39	22

The saskatoon – slender wheatgrass steppe ecosystem was lightly burned, with an average burn severity of 0.87. Kentucky bluegrass and snowberry both had a relatively

large decrease in cover following the burn. There was also a reduction in the cover of the other grasses, blue wildrye and junegrass. Snowberry cover was greatly reduced, although its presence remained steady at 64% of the plots.

Table 6: Stratum 3 – steppe.

Scientific Name	Common Name	2001		2002	
		Mean Cover	P	Mean Cover	P
Aster conspicuus	showy aster	15.28	56	19.52	48
Poa pratensis	Kentucky bluegrass	11.96	76	5.20	68
Symphoricarpos albus	snowberry	5.92	64	2.64	64
Lathyrus spp.	peavine	3.57	80	5.76	80
Amelanchier alnifolia	saskatoon	2.80	16	1.80	16
Rosa acicularis	prickly rose	2.80	40	3.40	32
Galium boreale	northern bedstraw	2.65	76	3.76	88
Thalictrum occidentale	western meadowrue	2.64	44	4.86	52
Elymus glaucus	blue wildrye	1.22	24	0.80	16
Koeleria macrantha	junegrass	1.16	48	0.74	36

The aspen stands and areas of encroaching aspen were burned with varying severities – some plots were unburned, others lightly burned, and others severely burned. The average burn severity was 1.15. All young trembling aspen (aspen is only recorded in a Daubenmire plot if it is in the B1 [low shrub] layer) were killed by the fire, as was most of the snowberry.

Table 7: Stratum 4 – aspen stands & areas of young, encroaching aspen.

Scientific Name	Common Name	2001		2002	
		Mean Cover	P	Mean Cover	P
Aster conspicuus	showy aster	24.44	88	28.31	88
Amelanchier alnifolia	saskatoon	24.31	63	13.00	38
Rosa acicularis	prickly rose	14.50	69	14.94	81
Thalictrum occidentale	western meadowrue	6.19	63	10.33	69
Lathyrus spp.	peavine	4.53	75	11.75	75
Symphoricarpos albus	snowberry	4.44	38	0.94	25
Clematis occidentalis ssp. grosseserrata	blue clematis	3.13	13	1.31	13
Acer glabrum	Douglas maple	2.33	13	4.06	6
Populus tremuloides	trembling aspen	2.19	13	0.00	0
Disporum trachycalum	rough-fruited fairybells	1.56	13	1.63	25

4.2.3 By burn severity

It was expected that the more severely burned a plot was, the greater the change in vegetation would be. The data show that burned plots had greater vegetation changes than unburned plots, but do not consistently show that severely burned plots had greater vegetation changes than lightly burned plots. Perhaps this is because even our 'severely' burned plots had relatively little below-ground impact on the vegetation. *Lathyrus* species had their greatest increase on unburned plots, showing that vegetation cover --especially for herbaceous species-- will change from year to year, even in the absence of fire.

Table 8: Change (from 2001 to 2002) in mean cover of ten most common species (see Table 2) on sample site, by burn severity. A negative number indicates a decrease in cover.

Scientific Name	Common Name	Unburned	Lightly burned	Severely burned
Aster conspicuus	showy aster	0.06	13.46	11.53
Amelanchier alnifolia	saskatoon	-4.56	-8.31	-2.87
Rosa acicularis	prickly rose	0.06	1.14	-2.27
Symphoricarpos albus	snowberry	-0.07	-4.90	-7.39
Thalictrum occidentale	western meadowrue	0.25	1.71	4.89
Poa pratensis	Kentucky bluegrass	-0.13	-3.52	-2.45
Lathyrus spp.	peavine	6.45	2.02	2.02
Galium boreale	northern bedstraw	-2.13	1.68	1.61
Populus tremuloides	trembling aspen	0.00	-0.22	-6.33
Castilleja miniata	common red paintbrush	-0.35	1.16	0.07

4.3 Aspen plots

Aspen vigour was not clearly or consistently affected by burn intensity (Table 9, Figure 2). Of the 127 trees monitored, only 8 were found to have died after the fire. These 8 trees were in aspen plot #1, which was a shallow, rocky site containing very small, poor aspen trees. One of the trees was likely dead before the fire. Many of the lightly and severely burned trees were bleeding sap. Future monitoring can study whether this will affect tree vigour in the future. *Venturia* blight (an aspen foliage disease, widespread in 2002) was observed on Grouse Mountain this summer, but was not significantly present in any of the aspen plots. Only plot 1 appeared to have minor *Venturia*. However, many of the smaller (less than 2 m high) aspen in the sampling area had the blackened and bent 'shepherd's crook' top that is characteristic of *Venturia*.

The five aspen plots contained aspen trees over 2m in height. The larger the aspen, the less it appears to have been affected by fire. Data from the Daubenmire plots suggests that fire kills young aspen. It would be useful to establish aspen plots where the aspen are still suckers, under 2m high, and see how the fire affects them. The permanent ecoplot is also established in an area in which there were many smaller aspen.

Table 9: Mean vigour of aspen trees by plot and burn severity.

Aspen plot #	Burn severity	Vigour
1	1	0.8
	2	0.6
2	0	2.6
	1	2.2
	2	2.1
3	1	1.9
	2	1.9
4	0	2.25
	1	2.4
	2	2.2
5	0	2.3
	1	2
	2	2.2

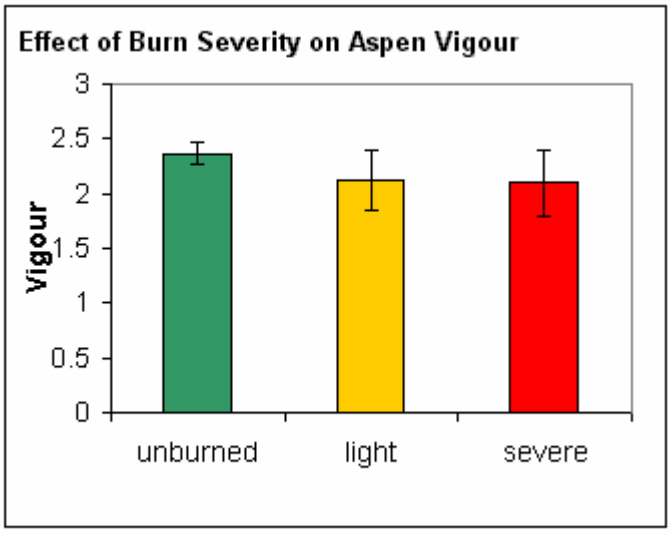

Figure 2: Effect of burn severity on aspen vigour. Aspen plot 1 data was not included in the data for the chart, as it is a plot in which all the trees are of extremely poor condition.

5.0 RECOMMENDATIONS

Data from the first summer following a spring burn is not enough to reach conclusions about the success/failure of burning to achieve certain objectives. The literature shows that many species are initially top-killed by fire, only to return to or exceed pre-fire levels in as little as 1 to 3 years (Oikos 2002). It was already evident this summer that many of the shrubby species were vigorously resprouting. Species that have shown an initial increase in cover, such as showy aster, will not necessarily remain at this level once the immediate post-burn nutrient flush has subsided. Longer-term monitoring is therefore recommended. Resampling should take place next summer, then every other year for 4 years, and then at 5 year intervals, as needed. This will provide sufficient information to describe the post-fire vegetation patterns on the site.

Future re-burning is a must to deal with the aspen and many of the shrubs. Repeated fires are necessary in most cases to kill aspen suckers and other shrub species (Oikos 2002). Before a second fire, more aspen plot areas should be set up, and data collected on pre-fire vigour, DBH and height. Although it may be difficult to implement, it would be useful to burn only half of the sampling area, and to burn only half of each aspen plot, or alternatively, to establish adjacent monitoring areas that could remain unburned or receive single or multiple burns. These would provide controls for the experiment.

There are four other sites in the Prince Rupert Forest Region which have similar sampling areas set up on them (Oikos 2002). They are located on Colleymount Butte (Lakes District), Summit Lake/Telegraph Trail (Morice District), Hubert Hill (Bulkley District, property is owned by HCTF), and Tenas Hill (Kispiox District). A separate mapping and research project carried out by Oikos identified grassland-aspen complexes in the PRFR and listed criteria by which such sites could be prioritised for treatment (Oikos 2002b). These sites, if burned, will provide the necessary replication to properly monitor vegetation response to prescribed burning on Saskatoon-slenderwheatgrass scrub-steppe ecosystems.

6.0 REFERENCES

Oikos Ecological Services Ltd. (2002) Restoration of native grasslands in the Prince Rupert Forest Region – Final Report. Contract report to Colene Wood, Terrestrial Ecosystem Restoration Program (TERP), Victoria, B.C.

Oikos Ecological Services Ltd. (2002b) Overview of grassland – aspen interactions in the Prince Rupert Forest Region. Contract report to Don Russell, Prince Rupert Forest Region, Smithers, B.C.

Resources Inventory Committee. (1998) A Field Manual for Describing Ecosystems in the Field. B.C. Ministry of Environment, Lands and Parks, B.C. Ministry of Forests, Land Management Handbook No. 25., Victoria, B.C.

Appendix I: Maps

Appendix II: Raw Data

May 2002 **Burn extent & severity**

August 2002 **Daubenmire plots**
Line Intercept Transects
Aspen Vigour Data
FS882 Permanent Sample Plot

Appendix III: Photos