FIELD SAMPLING TO ASSESS PROPOSED ECOSYSTEM RESERVE AREAS

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Executive Summary

Pope & Talbot Ltd. is committed to Sustainable Forest Management Planning (SFMP) on its management units in British Columbia. An important component of their SFMP is the management of biodiversity values, including maintaining a proportion of representative ecosystems in an unmanaged state.

Previous analyses have grouped and mapped site series “clusters” of unique ecosystems on the Boundary TSA, and a method was developed to estimate the ecological risk associated with the relative distribution and abundance of each ecosystem in the unmanaged land base. More recently, an analysis was conducted to identify potential ecosystem reserve areas which optimize the full suite of SFMP values. The purpose of this project was to sample within these potential reserve areas to:

- assess whether ecosystems were consistent with the predictive ecosystem map that was used to identify potential reserves;
- assess old growth attributes according to ILMB’s assessment methods; and,
- characterize coarse woody debris volumes and snag attributes.

Field data were collected at 55 plots on the Boundary TSA, distributed among 6 biogeoclimatic subzone variants. Most of the potential ecosystem reserves visited during the study had attributes consistent with old forest; however, they could not be considered unmanaged and were often associated with structural attributes consistent with younger stands.

The results of this study suggest that the field investigations were largely consistent with expectations of strategic-level analyses. This increases confidence in the maps and tools that have been developed to generate the proposed system of ecosystem reserves, although additional ground sampling might be necessary. As a result, the final selection of ecosystem reserves can focus on the required decisions related to trade-offs among values, including the desirability of old attributes versus better ecosystem representation.

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Introduction

Pope & Talbot Ltd. is committed to Sustainable Forest Management Planning (SFMP) on its management units in British Columbia. An important component of their SFMP is the management of biodiversity values, as articulated by three indicators:

1. Ecologically distinct habitat types are represented in an unmanaged state;
2. The amount, distribution and heterogeneity of habitat elements and landscape structure important to sustain biological richness are maintained; and,
3. Productive populations of selected species or species guilds are well-distributed throughout the range of their habitat.

With respect to the first indicator, previous analyses have grouped site series into "clusters" of unique ecosystems throughout the West Kootenay (Wells et al. 2004). These clusters have been mapped in the Boundary portion of the Arrow-Boundary Forest District and a method has been developed to estimate the ecological risk associated with the relative distribution and abundance of each ecosystem in the unmanaged land base (Wilson 2004). Timberline and Wilson (2006) developed methods and conducted an analysis that identified potential ecosystem reserve areas which optimize the suite of SFMP values. The SFMP values considered were:

- distinct ecosystems represented in an unmanaged state;
- coarse woody debris volumes;
- snag density;
- mountain pine beetle susceptibility;
- Visual Quality Objectives;
- Ungulate Winter Range;
- stand merchantability; and
- old forest representation.

The purpose of this project was to sample areas proposed to be ecosystem reserves within the Boundary TSA. The objectives of the sampling were to:

- assess whether ecosystems were consistent with the predictive ecosystem map that was used to identify potential reserves;
- assess old growth attributes according to ILMB's assessment methods; and,
- characterize coarse woody debris volumes and snag attributes.

The Integrated Land Management Bureau of the BC Ministry of Agriculture and Lands (ILMB) has drafted Old Growth Management Areas (OGMAs) for the Boundary TSA with the intent of preserving rare or endangered ecosystems with old attributes. Pope & Talbot's goal is to recommend a system of ecosystem reserves that meets or exceeds the biodiversity protection afforded by ILMB's draft OGMAs.

Methods

Project Area

The Boundary TSA covers approximately 580,000 ha, of which approximately 288,000 ha is considered available for timber production (Ministry of Forests 2000). The TSA is ecologically diverse, with ecosystems ranging from low-elevation, dry, pine-dominated rangelands in the south, to relatively wet, high-elevation Engelmann spruce-subalpine fir parkland forests and alpine tundra (Figure 1).

Sampling Design

We used the following method to identify the location of field sampling plots:

1. we flagged all contiguous areas >20 ha among the potential ecosystem reserves mapped by Timberline and Wilson (2006);
2. we then generated plot locations at or near the geometric centre of each flagged polygon and mapped this point in relation to the road network and topographic features;
3. field crews chose points for sampling from among those on the map that were relatively accessible and allowed them to conduct >2 plots per day.

Most of the plot locations were accessible due to the Boundary's extensive road network and relatively gentle terrain.

Field Sampling Methods

Sampling followed *Resources Information Standards Committee* methods. Specifically, forest stand structure and old growth tree attribute data were recorded on the *Tree Attributes for Wildlife* (TAW) FS882(6) field form and coarse woody debris were recorded on the FS882(7) field form. Data collected also included a site series and structural stage call.

ILMB's Old Growth Assessment Criteria

In addition to standard data collection, each plot was assessed for old growth attributes according to criteria ILMB had used during aerial survey flights (Holt 2000). These criteria included:

- presence of larger trees (N-L-M-H);
- large tree species;
- presence of veteran trees (N-L-M-H);
- presence of snags (N-L-M-H);

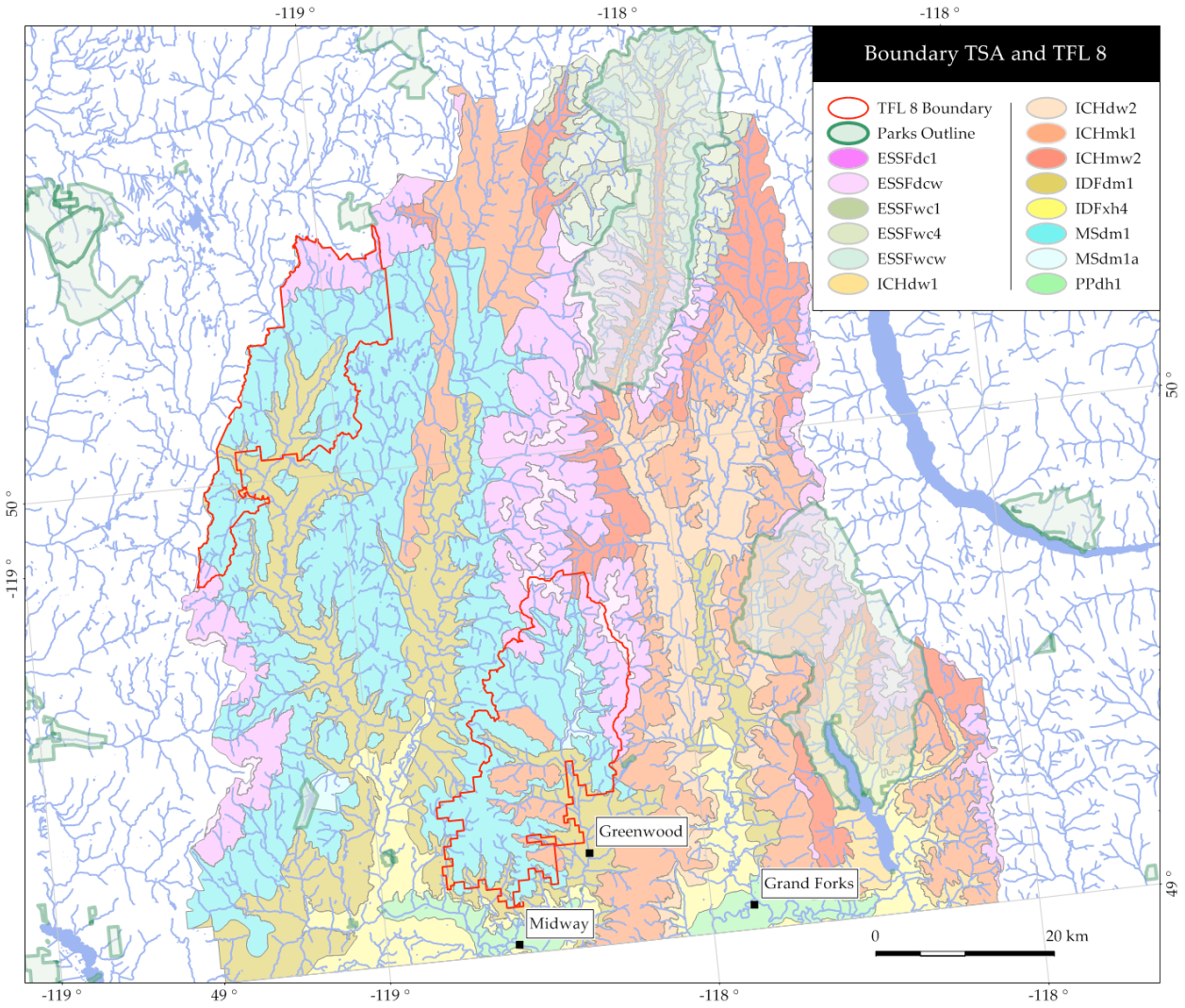

Figure 1. Boundary TSA (and TFL 8) illustrating the distribution of different biogeoclimatic subzone variants.

- presence of broken tops (N-L-M-H);
- presence of dead tops (N-L-M-H); and,
- overall rating (1-5).

Although the assessment criteria used at ground sampling plots were the same as those used by ILMB, the data collected during this project provided finer-scale information over a smaller spatial extent than data collected during aerial surveys. For that reason, plot and aerial survey data could not be directly compared. However, the ILMB assessment method data are presented to provide an additional check on the old growth assessment of each plot and they may be analyzed in the future as candidate reserve areas are further refined.

Analysis

Site series calls made at field plots were compared with the predictive ecosystem map (PEM) for the Boundary TSA in order to assess the goodness of fit of the PEM. Some plots were considered to span two site series; in these cases, the PEM was considered correct if either of the site series identified in the field was correctly classified by the PEM. For assessing the spatial accuracy of the ecosystem clusters defined by Wells et al. (2004) and mapped by Wilson (2004), we also determined the proportion of correct classifications based on ecosystem clusters.

Old growth attributes collected according to ILMB's criteria were reported but not further analyzed.

Coarse woody debris volumes were calculated according to Van Wagner (1982), by biogeoclimatic subzone variant, site series and structural stage.

Snags were summarized as the percent of sampled trees ≥20 cm diamter-at-breast-height (dbh) with an appearance code of >2 (BC Ministry of Environment, Lands and Parks and BC Ministry of Forests 1998). This corresponded to trees with some or all foliage lost, possibly some twigs lost, all branches usually present, and a possible broken top. This represents a liberal definition of a snag. Snags/ha could not be calculated because trees were sampled in plots using a prism sweep. This was more practical than characterizing every tree within the plot.

Results

Field data were collected at 55 plots on the Boundary TSA during the study. The plots were distributed among 6 biogeoclimatic subzone variants (Table 1). Not all sample sizes presented here sum to 55 plots due to some missing data, which resulted from a variety of circumstances.

Table 1. Distribution of field plots among biogeoclimatic subzones variants on the Boundary TSA. Data were collected to determine ecosystems and to assess old growth attributes.

BIOGEOCLIMATIC ZONE	SUBZONE VARIANT	NUMBER OF PLOTS
ESSF	dc1	14
ESSF	wc4	2
ICH	mk1	3
ICH	mw2	1
IDF	dm1	19
MS	dm1	15

Goodness-of-fit of Field Data to the Predictive Ecosystem Map

At 33 of 54 plots (61%), the field site series call matched the PEM (Table 2). When plots that fell within the same ecosystem cluster were considered (Wells et al. 2004), this proportion rose to 81%.

Table 2. Goodness-of-fit of PEM site series call to those in the field. Also reported are whether the calls that did not fit the PEM were located in the same ecosystem cluster, as defined by Wells et al. (2004).

BEC	FIELD SITE SERIES	PEM CORRECT	INCORRECT BUT SAME ECOSYSTEM CLUSTER	INCORRECT	PERCENT CORRECT CLUSTER
ESSFdc1	04	1	11	0	100
ESSFdc1	05	0	0	1	0
ESSFwc4	01	1	0	0	100
ESSFwc4	04	0	0	1	0
ICHmk1	01	3	0	0	100
ICHmw2	04	1	0	0	100
IDFdm1	01	2	0	0	100
IDFdm1	03	1	0	1	50
IDFdm1	04	11	0	0	100
IDFdm1	05	0	0	1	0
MSdm1	01	3	0	2	60
MSdm1	03	0	0	1	0
MSdm1	04	9	0	3	75
Total		**33**	**11**	**10**	**81**

Old Growth Assessment by ILMB's Methodology

Detailed information was collected on the suitability of each plot with respect to ILMB's criteria for assessing old growth attributes (Appendix).

Coarse Woody Debris Assessment

Coarse woody debris volumes were highly variable among and within different ecosystem units and structural stages (Table 3). The highest volumes were recorded in the ESSF and the lowest volumes in dry units of the ICH, IDF and MS biogeoclimatic zones.

Table 3. Summary of coarse woody debris volumes (m^3/ha) by biogeoclimatic subzone variant, site series and structural stage, estimated at field plots in the Boundary TSA during assessment of potential ecosystem reserves.

ZONE	SUBZONE VARIANT	SITE SERIES	STRUCTURAL STAGE	N	VOLUME	STANDARD DEVIATION
ESSF	dc1	04	6	10	214	77
ESSF	dc1	04	7	3	426	169

ZONE	SUBZONE VARIANT	SITE SERIES	STRUCTURAL STAGE	N	VOLUME	STANDARD DEVIATION
ESSF	dc1	05	7	1	193	
ESSF	wc4	04	7	2	506	14
ICH	mk1	01	6	3	145	40
ICH	mw2	04	6	1	59	
IDF	dm1	01	6	2	262	260
IDF	dm1	03	6	3	50	37
IDF	dm1	04	5	4	133	130
IDF	dm1	04	6	8	72	75
IDF	dm1	04	7	1	327	
IDF	dm1	05	6	1	156	
MS	dm1	01	5	2	131	73
MS	dm1	01	6	1	172	
MS	dm1	01	7	1	196	
MS	dm1	04	5	1	49	
MS	dm1	04	6	5	221	201
MS	dm1	04	7	5	121	55

Snag Assessment

The average proportion of snags among ecosystem units and structural stages varied from 0 to 44%, and were highly variable (Table 4). The highest proportion of trees classified as snags generally occurred in structural stage 7 plots.

Table 4. Summary of the proportion of snags within plots by biogeoclimatic subzone variant, site series and structural stage, estimated at field plots in the Boundary TSA during assessment of potential ecosystem reserves. Snags were defined as trees ≥20 cm dbh with an appearance code of >2 (BC Ministry of Environment, Land and Parks and BC Ministry of Forests 1998).

ZONE	SUBZONE VARIANT	SITE SERIES	STRUCTURAL STAGE	N	SNAGS (%)	STANDARD DEVIATION
ESSF	dc1	04	6	10	21	15
ESSF	dc1	04	7	3	44	25
ESSF	dc1	05	7	1	14	
ESSF	wc4	04	7	2	34	33

ZONE	SUBZONE VARIANT	SITE SERIES	STRUCTURAL STAGE	N	SNAGS (%)	STANDARD DEVIATION
ICH	mk1	01	6	3	14	
ICH	mw2	04	6	1	18	
IDF	dm1	01	6	2	40	
IDF	dm1	03	6	3		
IDF	dm1	04	5	4	15	2
IDF	dm1	04	6	8	12	6
IDF	dm1	04	7	1	14	
IDF	dm1	05	6	1	36	
MS	dm1	01	5	2		
MS	dm1	01	6	1	33	
MS	dm1	01	7	1	25	
MS	dm1	04	5	1	17	
MS	dm1	04	6	5	14	
MS	dm1	04	7	5	25	22

Discussion

Goodness-of-fit of Field Data to the Predictive Ecosystem Map

Clearly one of the most significant results from this project was the goodness-of-fit of the PEM to the field data. Site series calls made at field plots corresponded to the PEM >60% of the time, which is an accuracy considered sufficient for making ecologically-based site index adjustments (according to direction from the Chief Forester, although note that this project did not conduct an accuracy assessment to a sufficient standard to fully test the PEM for such purposes).

Equally significant was the fact the correspondence between field plots and the PEM was >80% with respect to ecosystem clusters (Well et al. 2004). This was an important result, because the PEM is the basis for defining the spatial distribution and extent of unique ecosystems in the Boundary TSA. Accurate ecosystem mapping is required to ensure that the proposed system of ecosystem reserves is capturing the ecological characteristics inferred by the PEM.

Characterizing Coarse Woody Debris and Snags

Both coarse woody debris and snags are important indicators of old growth forest attributes. The data collected during this project suggested that coarse woody debris levels were somewhat higher than those

predicted by models used for assessing CWD distribution and abundance (Timberline and Wilson 2004). This suggests that these models should be revisited and adjusted.

Snag data collected during this project could not directly be converted to a snag/ha measure, but this could be estimated using available stems/ha estimates, by diameter class and ecosystem (BC Ministry of Forests 2001). Updated snag/ha estimates could then be used to update the snag models used to predict the abundance and distribution of snags in Boundary TSA ecosystems.

Assessment of Old Growth Attributes

Using either provincial standard information, or data collected according to ILMB's assessment methodology, there were trends that clearly emerged during the field investigations. Most, if not all plots visited had some indication of past forest-harvesting activity. The intensity of past harvesting varied, but most sites showed signs of selective harvest. Also, the effect of decades of fire suppression was evident. As a result, sites were often associated with some old forest structures, but ingrowth of young fir and/or pine was common (Figure 2).

To some extent this was not unexpected, because all of the plots were located on the timber harvesting land base (THLB), and many were in accessible locations relatively close to roads. Many of the sites were also located in relatively dry ecosystems that historically were dominated by frequent disturbances by fire. This means that few of the potential ecosystem reserves that could be established on the timber-harvesting land base could be considered entirely "unmanaged". In this situation, the THLB portion of the proposed system of ecosystem reserves will likely represent the "best of a bad situation". Looking to the future, fire suppression is likely to continue, which suggests that some "unmanaged" stands in the driest ecosystems might be candidates for some kind of treatment, just to maintain the attributes for which they are being left "unmanaged". Treatment of these sites would be consistent with creating ecological conditions suitable for a number of other values, including ungulate winter range and habitat for rare and endangered species, such as Williamson's sapsucker (*Sphyrapicus thyroideus*).

Figure 2. Example of plot containing some older structure but in-filling with younger stems, as a result of fire suppression in combination with selective harvest.

In conclusion, most of the potential ecosystem reserves visited during this study had some attributes consistent with old forest; however, they could not be considered unmanaged and were

often associated with structural attributes consistent with younger stands. Whether this situation is similar in areas that Timberline and Wilson (2006) recommended for deletion as ecosystem reserves is unknown, because these areas have not yet been investigated.

The results of this study suggest that the field investigations were largely consistent with expectations from Timberline and Wilson's (2006) strategic-level analysis. This increases our confidence in the maps and tools that have been used to generate the proposed system of ecosystem reserves, although additional ground sampling might be necessary. As a result, the final selection of ecosystem reserve areas can focus on the required decisions related to trade-offs among values, including the desirability of old attributes versus better ecosystem representation.

Management Recommendations

We offer the following recommendations arising from this project:

- Site series information, as well as coarse woody debris and snag data, should continue to be collected in the Boundary TSA, in order to improve the predictive models used in biodiversity management as part of Pope & Talbot's SFMP;
- Models estimating coarse woody debris volumes and snag densities should be updated to reflect data collected during this and any other recent projects on the Boundary TSA;
- Even though ecosystem reserves are considered part of the unmanaged land base, reserves in dry ecosystems will likely require treatments to maintain suitable attributes. A strategy to implement such treatments should be developed;
- Some areas recommended for deletion as ecosystem reserves (i.e., ILMB draft OGMAs that ranked low according to the selection criteria used by Timberline and Wilson 2006) should be investigated to assess their attributes relative to those areas being recommended as additions;
- Work to establish the system of ecosystem reserves should continue to focus on the trade-offs among the values being considered in the evaluation of areas.

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Appendix

Assessment of plots according to ILMB methods:

PLOT	LARGE TREE	SPP	VET	SNAG	BROKEN TOP	DEAD TOP	RAT-ING	COMMENTS
1019	L	Fdi	N	L	L	L	3	above riparian, cows, recruitment potential
FR01	L	Cw,Fdi	L	L	L	L	2	highgraded, large stumps
586	L	Fd,Lw	N	L	L	L	2	highgraded
712	M	Fd,Lw	N	M/H	M	M	4	high recruitment of snags, recruitment potential
1079	L	Fd,Lw	N	L	L	L	2	inside cutblock, logged last 5 years
77	M	Bl,Sx	N	M/H	L	L	4/5	good connectivity, excellent OG attributes
80	L/M	Bl,Sx	N	M	L	L	4/5	good connectivity, excellent OG attributes
131	L	Bl,Sx	N	L	L	L	2	surrounded by young forest, narrow strip
154	H	Sx,Cw	N	M	L	L	4	
163	L	Sx	N	L	L	L	2	surrounded by young forest, narrow strip
385	L	Fd,Sx,Lw	N	L	L	L	1/2	highgraded, transition seral to climax
398	L	Fd,Lw	N	L	L	L	1/2	highgraded, transition seral to climax
876	H	Sx,Bl	N	M	L	L	4	
878	H	Sx,Bl	N	M	L	L	4	riparian area adjacent to and in stand
1221	M/H	Lw,Sx,Cw,Fd	N	M	M	M	3/4	recruitment potential
1186	H		M				4/5	area viewed with binos from vantage point on Sutherland Cr Rd (Blk060-06); area next to old fire, continuity good, inaccessible, stand is in back end of drainage, appears to have a number of vets
577	L	Lw(Fdi)	L	L	L	L	2	highraded, drainge below site, inside proposed cutblock, TSL A76151 blk1 laid out 05
744	M	Lw	L	L/M	L	L	3	lots of woodpecker feedling on large Lw, quite a few snags
705	L/M	Lw	M	L	L	L	3	unique tree sp = black cottonwood. Large Lw vets in uppper canopy. Snags fed on by woodpecker. Majority of canopy occupied by 13-20m Fd/Pl. Some recruitment potential.
721	L/M	Lw(Fd)	M	L	L	L	2	large Lw (Fd) dominate upper canopy, dry drainage below site. Majority of canopy consists of mixed Pl/Fd (8-20m)
103	M	Bl/Se	L	M	L	L	3	semi-open ESSF stand, high CWD. Large stream 150m below site.
107	L/M	Bl(Se)	L	M	L/M	L/M	3	lots of Lg. diameter CWD. Dead and dying balsam frequent in canopy. ~300m from creek. Low use of snags. Lots of gaps in canopy and regenerating ES/SF.

PLOT	LARGE TREE	SPP	VET	SNAG	BROKEN TOP	DEAD TOP	RAT-ING	COMMENTS
18	M	Lw(Sxw)	M	L/M	L	L	4	good recruitment, lots of 30-50cm Cw/Sxw. Stand appears to continue across valley. Large Lw = vets from last fire disturbance. This plot might be slightly biased towards Lw vets. Lw snags well used by woodpeckers.
250	M	Se/Bl	N	M	L	L	3	lots of blowdown. Moist, receiving site. High densities of regenerating ES/SF in understory. Low use of snags. Stream beside site. Inside proposed cutblock CP164 BK9 FC121 Jan 27/94
255	M	Se(Bl)	N	H	L	L	2/3	low, receiving site adjacent to small stream. High blowdown. Bl snags abundant and fed on by wood-peckers. Conductivity appears relatively poor, as with site 250.
365	M	Se(Bl)	N	M	L	L	2/3	site is in very moist receiving area. Stand appears to be fragmented to North and West but possible conti-nuity SE?
360	L/M	Se	N	H	L	L	2/3	cont. relatively poor (to S, W & N). Moist site, high number of snags.
943	L	Fdi	L	L/M	L	L	3	mature Fdi stand on steep, W aspect. Largest trees growing in draws. Crests = very dry and exposed. Snags well used by woodpeckers. Good recruitment potential.
509	M	Se/Bl	N	H	L	M	3	large number of dead standing Bl/Se. Site has poor connectivity. High CWD. Snags well used by wood-peckers. Site was moved ~60m SW because area was logged. * High lichen loads
817	L	Fd/Lw	L	L	L	L	3	site is on edge of steep canyon. Continuous across canyon to the east.
822	L	Fd(Lw)	L	L	L	L	3	steep, rocky slope above grassy SW aspect downslope. Some recruitment potential. Continuity appears good.
428	L	Se(Bl)	N	L/M	L	L/M	3/4	lots of dead Bl in upper canopy. Stream below site. Stand is continuous to south and east. *inside poten-tial block Laid out RO7022, RP#107 CP304
528	H	Se(Bl)	N	M	L	L	3	lots of lg. diameter Se & snags. Connective to N? Fragmented to south and west.
926	L	Fd/Py	M	L	L	L	3	plot moved 100m from blk. In same polygon as cut-block. Veteran Py in upper canopy, continuous to the north.
656	M	Fd/Lw	L/M	L/M	L	L	2/3	"logged previously (mostly large Lw) Well-spaced Fd and occasional Lw dominate upper canopy.

PLOT	LARGE TREE	SPP	VET	SNAG	BROKEN TOP	DEAD TOP	RAT-ING	COMMENTS
Re-gener-ating Fd in high num-bers in under-story. Snags well used by wood-peck-ers."	545	L/M	Lw/ Fd	H	M	L	L	3
"quite a few large Lw vets and lots of regen-erating Fd/Lw 2-20m. Site is on edge of steep ravine & is con-tinu-ous across.	Patches where stand is com-prised almost entirely of Lw (20-30m) and Fd regen (<10m) are well estab-lished."	939	L	Fd/Lw	L	L	L	L
2	plot moved 30m to east is severely frag-mented.	932	L	Fd	N	L	L	L
2	frag-mented, few OG attrib-utes.	958	L	Sxw(Fd)	N	L	L/M	L
2/3	draw below site unique tree spp = black cotton-wood, connec. appears poor.	912	L	Fd/Lw	M	L	L	L

PLOT	LARGE TREE	SPP	VET	SNAG	BROKEN TOP	DEAD TOP	RAT-ING	COMMENTS
3	some vet larch and mature and regen Fd/Pl in lower canopy. Recruit-ment potential.	1018	L	Fd	N	L	L	L
2	high-graded, semi-open Fd stand. Possibly continu-ous to NE.	1036	L	Fd/Lw	L	L	L	L
3	scattered stands of mature Fd/Lw prevalent along hillside, although mojority of forest is younger Fd snags used by wood-peckers. Continu-ity = fair (cont. to S).	1089	M	Fd/Lw	L	L/M	L	L
3	logged at some point, large Fd & Lw frequent in stand now. Connec. appears relatively poor. Snags well used by WO. Recruit. potential.	988	L	Fd(Lw)	L	L	L	L

PLOT	LARGE TREE	SPP	VET	SNAG	BROKEN TOP	DEAD TOP	RAT-ING	COMMENTS
2/3	logged long time ago, pond below site. Recruit potential.	989	L	Fd(Lw)	L	L	L	L
2	cattle grazed, logged before. Some recruit potential.	810	L	Lw/Py	L	M	L	L
2	lots of dead Fd with pocket fungus. Connec. appears poor. Dry creek below site. Heavily grazed	767	L/M	Lw/Fd	M	M/H	M	L
3	substan-tial num-ber of vets and Lw/Fd snags. Stand appears to be frag-mented (esp. to N). Draw below site Fd snags = pocket fungus. Well used by WO.	763	L	Fd	L	L	L	L
2	logged before. Some recruit-ment potential. Few OG attrib-utes.	655	L	Lw/Fd	L/M	L/M	L	L/M

PLOT	LARGE TREE	SPP	VET	SNAG	BROKEN TOP	DEAD TOP	RAT-ING	COMMENTS
2	logged previ-ously, a few Lw vets remain.	1006	L	Fd	L	M	L	L
2/3	logged previ-ously,so me recruit-ment potential. Fd snags well used by WO. Possibly continu-ous to SE.	1010	L/M	Fd	L	L/M	L/M	L
3/4	steep semi-open Fd stand. Snags heavily exca-vated. Continu-ous E-W. Heavy lichen loads.	749	M	Fd(Lw)	L	L	L	L
3	logged previ-ously, large Fd (Lw) now present in stand.	718	L	Fd(Lw)	L	M	L/M	L
3	connec. appears good, snags well used by WO. Recruit-ment potential.	694	M	Fd(Lw)	M	M	L	L
3/4	snags heavily exca-vated by WO, quite a few large Fd & Lw. Nice stand.	973	L/M	Fd/Lw	L/M	L	L	L

PLOT	LARGE TREE	SPP	VET	SNAG	BROKEN TOP	DEAD TOP	RAT-ING	COMMENTS
3	stand is on steep gulley bank with a creek below. Continu-ous up creek drain-age.	991	L	Fd(Lw)	L	L	L	L
2/3	logged previ-ously. Site is near bottom of a draw with dry creek. Recruit-ment potential.							