Southern Interior Region: Summary of Stand-level Biodiversity Sampling

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FREP

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INTRODUCTION

The purpose of this extension note is to improve understanding of the stand-level biodiversity outcomes related to harvesting and retention forest practices at the regional level. The information presented here can facilitate discussions on biodiversity practices and highlight opportunities for continuous improvement. The key audience for this note is natural resource management professionals and managers. This analysis provides an overview of the Southern Interior Forest Region as a whole with a more detailed look at its predominant biogeoclimatic subzones. The data is from cutblocks harvested between 1999 and 2006 and sampled by the Forest and Range Evaluation Program (FREP) during the 2006-2009 field seasons (see Figure 1, Table 1).

Stand-level biodiversity is one component of the biodiversity value noted in the Forest Planning and Practices Regulation, under the *Forest and Range Practices Act* (*FRPA*). The FREP is assessing how well these values are being maintained.

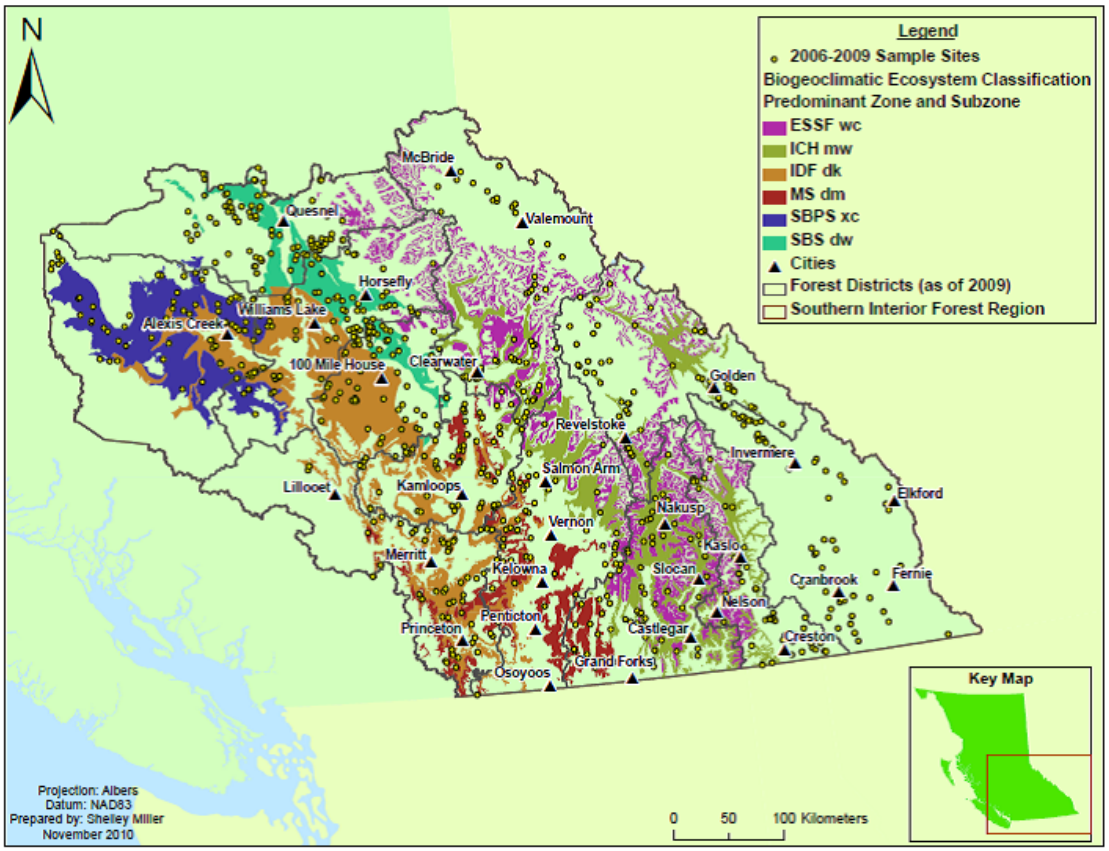

Figure 1. *FREP stand-level biodiversity assessment location and predominant subzones.*

The FREP Mission:
To be a world leader in resource stewardship monitoring and effectiveness evaluations; communicating science-based information to enhance the knowledge of resource professionals and inform balanced decision-making and continuous improvement of British Columbia's forest and range practices, policies and legislation. *http://www.for.gov.bc.ca/hfp/frep/index.htm*

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Though the data presented here is from cutblocks harvested under the previous legislative regime (*Forest Practices Code of British Columbia Act*), the results provide a baseline for future monitoring of *FRPA* cutblocks. Stand-level biodiversity, particularly the retention of live and dead standing trees and coarse woody debris (CWD) within harvested cutblocks, is an important, (if not essential) component of wildlife habitat maintenance (for species dependent on mature and old-forest characteristics), and vital for maintaining healthy ecological functions such as hydrology, soil productivity, and species dispersal.

GENERAL DESCRIPTION OF SOUTHERN INTERIOR FOREST REGION SAMPLE CUTBLOCKS

- 651 cutblocks sampled
- 91% of cutblocks had ≥ 0.5% retention
- 20 509 ha total gross area
- 11% (2154 ha) of patch (long-term) retention
- 6% (1260 ha) of dispersed retention (basal area equivalent[1])
- 17% average retention
- 44% of retention constrained[2]
- 23% of patches are greater than 2 ha
- Average of 3 ecological anchors per hectare of retention
- Average of 7% windthrow
- 35% of patches internal to cutblock; 61% on the edge; and 4% external and non-contiguous to the cutblock
- Invasive species were found on 38% of the cutblocks.

ENGELMANN SPRUCE SUBALPINE FIR WET COLD SUBZONE (ESSFwc) DISCUSSION

The ESSFwc subzone had retention within every cutblock; a highly recommended practise (Table 1). Average windthrow was 6.7%, a relatively low average, and there was a good mixture of retention patch locations with about 54% of the retention patches internal to the harvest boundaries, 42% on the edge of the harvest boundary and 4% external and non-contiguous to the harvest boundary.

The average density of large snags was 85% of the timber cruise baseline average. This may be partly due to the 25% of sampled ESSFwc cutblocks which had less than 5% retention, potentially making it difficult to leave large retention areas capable of safely housing dangerous snags. The overall density of large diameter trees in the retention was not significantly different from that found in the baseline. The tree species diversity in the retention was lower than the baseline with an average of 67% of that found in the baseline. About 60% of sampled cutblocks had only one or two tree species found, compared to just 15% of the baseline.

ESSFwc Consideration: *Continue practices of maintaining retention on every cutblock, having a good mix of retention patches location (internal to, and on the edge of, the harvest boundary), and, a good mix between patch retention and dispersed retention. A continuous improvement opportunity is to retain more than two tree species on cutblocks where they exist. Increase the density of big CWD pieces left on cutblocks.*

INTERIOR CEDAR HEMLOCK MOIST WARM (ICHMW) DISCUSSION

The ICHmw subzone had retention on 77% of cutblocks (Table 1). Therefore 23% of the FREP sampled cutblocks and 21% of the total gross area of sampled cutblocks had minimal or no retention. Average windthrow was 6.5% of the area retained.

The average density of large snags was low, at 66% of the cruise baseline average (see example wildlife tree in Figure 2). The average density of large diameter trees decreased from that found in the baseline (72%). Overall the tree species diversity is lower in the FREP sampled retention compared to the cruise baseline. The density of big CWD pieces on the harvested ICHmw areas is 45% of what is found in the ICHmw retention patches. This, along with the 1.6% (on average) of dispersed retention (recruitment CWD), and the CWD volume, is the best contribution to the CWD quality indicator of any of the six subzones reported here.

ICHmw Consideration: *Continue maintaining big CWD pieces on most cutblocks. Increase the percentage of harvested cutblocks with retention, retaining as wide a variety of tree species as possible.*

1 Dispersed retention area is given as basal area equivalent area (i.e., a scaling down of the actual dispersed area). It can be thought of as converting dispersed retention to an equivalent amount of patch area retention. For example, if a dispersed area contains 20% of the pre-harvest basal area, then reduce the actual area by 80%. Because pre-harvest data did not exist, for comparison purposes we used the basal area from retention patches on the same opening. If no retention patches were available, we used the average basal area for all other retention patches in the same biogeoclimatic subzone.

2 Retention is considered constrained for one or more of the following reasons: wet area, riparian management zone, riparian reserve zone, rock outcrop, non-commercial brush, non-merchantable timber, sensitive terrain or soil, ungulate winter range, wildlife habitat area, old growth management area, recreation feature, visuals, cultural heritage feature.

Table 1. *Summary of sampled biogeoclimatic subzones*[a]

	Cutblock size (ha)		Retention (average)				Windthrow	Retention patch location in relation to harvest boundary (%)			Retention patches > 2 ha		FREP tree indicator average as percentage of average baseline[f]			CWD average in harvested areas as % of average in retention patches	
Subzone (sample size)	Average	Maximum	Total (%)	Patch (%)	Dispersed (%)*	% of cutblocks with retention[b]	Average (%)	Internal[c]	On edge[d]	External[e]	% of total number of retention patches	% of cutblocks with a > 2 ha patch	Large snags	Large diameter trees	No. tree species	CWD volume per hectare	CWD big pieces per hectare[g]
ESSFwc (32)	30	111	13.5	8.4	5.1	100	6.7	55	41	4	30	38	84.7	73.9	67.3	88.3	21.7
ICHmw (75)	25	174	11.3	9.7	1.6	77.4	6.5	43	55	2	25	25	66.4	72.4	57.8	91.5	45.0
IDFdk (89)	31	257	26.8	12.5	14.3	93.3	6.6	29	69	2	35	42	67.0	70.0	109.6	78.8	26.2
MSdm (40)	29	180	8.7	7	1.7	87.5	6.8	28	68	3	18	18	135.0	130.1	113.1	77.7	12.4
SBPSxc (35)	40	174	13.9	13	0.9	88.6	15.8	36	60	3	43	54	271.4	461.9[f]	135.8	101.0	4.4
SBSdw (44)	36	218	19.0	14.7	4.3	97.7	6.8	26	63	11	31	32	37.3	113.9	92.3	86.1	35.8

a For subzone descriptions please go to: http://www.for.gov.bc.ca/hre/becweb/resources/classificationreports/subzones/index.html

b Blocks with 0.5% or more retention

c The internal patches provide areas of cover within the harvest cutblock, potentially allowing more movement of small animals and easier recruitment of understorey species throughout the cutblock.

d The edge patches have the potential of merging with forest cover outside of the cutblock, giving larger forested patches (even if temporarily); edge patches often supply more linear retention from stream riparian reserves, which can provide travel corridors.

e The external and non-contiguous retention patches are least preferred for stand-level biodiversity since there is little likelihood of providing direct ecologic benefits to the harvested area.

f The tree indicators presented are; large snags (dead trees > 10 m tall and > 30 cm diameter breast height (dbh)), large diameter trees (live and dead trees > 40 cm dbh for the IDFdk, MSdm, SBPSxc and SBSdw or 50 cm dbh for the ESSFwc and ICHmw) and number of tree species found on the cutblock.

g Big CWD pieces are > 20 cm diameter and > 10 m long

Figure 2. *Arrow Boundary forest district, bear marked tree in retention patch. Photo credit: Genevieve Lachance.*

INTERIOR DOUGLAS-FIR DRY COOL (IDFDK) DISCUSSION

Retention in the IDFdk (27%) is the highest of the six southern interior subzones presented here (Table 1). This is largely driven by the high amount of dispersed retention (14.3%). The IDFdk subzone had retention on 93% of cutblocks. Of the 7% of sampled cutblocks that had zero retention, half of those had a small amount of retention maintained, but were rounded to zero. Average windthrow was 6.6%.

The average density of large snags was 67% of the baseline average. The overall density of large diameter trees (see example in Figure 3) was not significantly different in the retention compared to the baseline. The number of tree species found on average in the retention is 110% of the cruise baseline, indicating that comparable tree species diversity is being maintained in retention patches compared to the timber cruise. The density of big CWD pieces on the harvested ICHmw areas is significantly lower at 26% of what is found in the IDFdk retention patches. However this 26% is supplemented with CWD recruitment coming from the high percentage of dispersed retention on the cutblock.

IDFdk Consideration: *Continue maintenance of; the full diversity of tree species within retention areas, comparable densities of large trees and, retention on over 93% of the cutblocks. A continuous improvement opportunity is to increase the densities of large snags in the retention areas. Increase density of big pieces of CWD in harvested areas (see figure 4).*

Figure 3. *Chilcotin forest district, large tree left as dispersed retention. Photo credit: Dan Hicks.*

MONTANE SPRUCE DRY MILD (MSDM) DISCUSSION

Retention is lowest in the MSdm (9%) of the six subzones presented here (Table 1). This subzone also has the lowest percent of large (> 2 ha) retention patches. However, this is counteracted by high quality of the retention in terms of equivalent or slightly higher densities of large snags and large diameter trees in the retention areas compared to the cruise baseline. The MSdm subzone had retention on 88% of cutblocks. Of the 12% of sampled blocks that had zero retention, more than half of those had a small amount of retention maintained, but were rounded to zero. Average windthrow was 6.8%.

The density of big CWD pieces on the harvested ICHmw areas is 12% of what is found in the ICHmw retention patches.

MSdm Consideration: *Continue maintaining retention areas with good densities of large snags, large diameter trees and the full diversity of tree species. Continuous improvement opportunities include leaving some level of retention on every cutblock and, where possible, leaving larger retention patches. Opportunities to increase the densities of big pieces of CWD within the harvest areas also exist.*

Figure 4. *Cascades forest district, Large trees with big CWD in the background. Photo credit: Dave Cornwell.*

SUB-BOREAL-PINE-SPRUCE VERY DRY COLD (SBPSxc) DISCUSSION

Average retention in the SBPSxc is 14%, and retention is present on 88% of the sampled cutblocks (Table 1). The large snag and large diameter tree sizes used are undoubtedly a stretch for this subzone. Trees of 40 cm dbh are a rare element in this subzone, showing up on only 25% of the cruise cutblocks. However, the high densities of these found on the top 25% of the sampled cutblocks (in terms of density of the indicator) may indicate that there is a "bias" towards selecting retention areas of larger trees where these trees exist, though this data does not show up as significant in the statistical test. Tree species diversity is increased within the FREP sampled retention compared to the cruise baseline. Average windthrow was 15.8%; a higher average than any of the other six predominant subzones.

The CWD volume on the harvested areas is comparable to that found in the retention patches however, the density of big CWD pieces on the harvested SBPSxc areas is 4% of what is found in the ICHmw retention patches.

SBPSxc Consideration: *Continue practices of maintaining retention areas with comparable or somewhat higher densities of large snags and big trees (where they exist) and the full diversity of tree species. Continuous improvement opportunities are to increase the densities of big pieces of CWD within the harvest areas and manage windthrow where possible.*

SUB-BOREAL SPRUCE DRY WARM (SBSdw) DISCUSSION

Average retention on the SBSdw is 19% with 4.3% coming from dispersed retention and the remainder from patch retention (Table 1). Retention was found in 98% of the cutblocks. The average density of large trees was equivalent to that found in the cruise baseline; as was the tree species diversity. The SBSdw showed the lowest percentage of patches found internal to the harvest boundary, compared to the other predominant subzones. Average windthrow was 6.8%.

SBSdw Consideration: *Continue practices of maintaining areas of both dispersed retention and patch retention and having retention on essentially every cutblock. Continue maintaining good quality retention in terms of density of large diameter trees and tree species diversity. Continuous improvement opportunities are to maintain more retention patches internal to the harvested boundary and to avoid the use of external (non-contiguous to harvest cutblock) retention patches.*

SUMMARY

Various harvesting and retention outcomes are evident throughout the Southern Interior Forest Region. In the six predominant subzones, the average retention ranges from 8.7% in the MSdm to 26.8% in the IDFdk. The retention quality indicators also vary greatly. For example, the FREP data collected in the MSdm and the SBPSxc showed consistently high biodiversity quality (i.e. equivalent or higher than baseline) for the three tree indicators presented (large snags, large diameter trees, and number of tree species). In comparison, the FREP data collected in the ICHmw subzone consistently showed lower biodiversity quality for these tree biodiversity indicators.

Without knowledge of retention landscape-level retention levels and quality, the question of whether the retention amount and quality is sufficient within a particular area or

subzone can only be partially answered. However, to provide basic levels of stand-level retention for habitat needs of some less sensitive (to harvesting) forest dwelling birds a 15% stand-level retention level has been suggested (Huggard, and Bunnell 2007). This average level was obtained in three of the six predominant subzones.

A consistent weakness in all subzones is the low density of big pieces of CWD (≥ 20 cm diameter and ≥ 10 m long). This is particularly an issue within the ESSFwc, MSdm, and SBPSxc subzones. It is less of an issue in the ICHmw, IDFdk and SBSdw subzones, where a combination of higher densities of big CWD pieces (though still significantly lower than found within retention patches) and dispersed treed retention potentially providing CWD recruitment, combine to give better CWD quality or potential quality.

REFERENCES

Huggard, D. J. and F. L. Bunnell. 2007. Stand-level retention and forest birds: A synthesis of studies. Centre for Applied Conservation Research, University of British Columbia, Vancouver, B.C.