Retention Mapping for
Non-Timber Objectives
Merritt Management Unit

Prepared for

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Executive Summary

The Ministry of Environment (MOE) initiated a project focused on identifying landscape level retention priorities incorporating a range of non-timber objectives. This project was to address concerns regarding accelerated harvest and silviculture activity aimed at salvaging mountain pine beetle infested forests. Three Management Units (Vanderhoof, Quesnel, and Merritt) were selected for the project. Common processes identified between these management units were to be used to develop a framework for planning retention, based on sound ecological principles, which could be applied to other areas in the province.

Funding for the project was provided by Forest for Tomorrow (FFT). J.S. Thrower & Associates Ltd., (JST) were contracted to complete the proposed work for the Merritt TSA.

The Merritt TSA includes 1.13 million hectares of land distributed across five natural disturbance types (NDT). The level of mountain pine beetle infestation and the subsequent harvesting is an elevating concern. On July 1, 2005, the Chief Forester determined an allowable annual cut (AAC) of 2,814,171 m^3 in the Merritt TSA. This includes an uplift of nearly one million m^3 to address the growing impacts of MPB infestation. Unlike other forest districts, no specific level of forest retention was associated with the uplift in the Merritt TSA.

All existing retention datasets were collected for the Merritt TSA. The recently completed Innovative Timber Supply Review (TSR) dataset was used as the basis for analysis as it included the majority of retention datasets. Timber Harvesting Land Base (THLB) was based on the TSR dataset, and included in the existing retention scenarios. Old Growth Management Areas (OGMAs) and some additional Wildlife Habitat Areas were added to this dataset. Partial retention datasets lacking specific retention information were not included in the existing retention dataset or profiles. Base maps of existing retention were completed to provide information regarding the abundance and distribution of existing retention.

Structural stage profiles of the landbase and existing retention were completed for each Landscape Unit (LU) by NDT. Initial priorities were guided by comparing these profiles to recommendations for structure profiles included in the Biodiversity Guidebook. Profiles of moisture regime for the landbase and existing retention were also completed to provide further information with which to set priorities. A Wildlife Habitat Ratings table was used to rank habitat types in terms of priority for retention. The ranking scheme considered provincially listed plant communities, 27 plant and wildlife suitability models, as well as available landbase area and existing level of retention.

Based on the described evaluation additional retention in the NDT2 was recommended for the Coldwater, Similkameen, Spius, and Tulameen LUs. All of the priorities are directed towards retaining old structure. The additional retention level recommended is 2% for the Tulameen, 5% for the Coldwater and Spius, and 48% for the Similkameen. The disproportionate level of retention recommended in the Similkameen is due the small amount of NDT2 in this LU combined with a low level of existing retention.

In the NDT3, additional retention priorities were identified for the Coldwater, Hayes, McNulty, Otter, Similkameen, Smith-Willis, Spius, Summers, Tulameen, and Upper Nicola. The level of proposed retention ranges from 5 – 10%. In the Smith-Willis, Spius, and Similkameen LUs the priorities are

directed at retaining mature structural stages. In the remaining LUs, the priority was directed towards retaining old structure. Based on the described evaluation no additional retention was recommended for the Lower Nicola and Swakum LUs.

In the NDT4, additional retention priorities were directed towards retaining old structure in all LUs. Retention levels ranged from <1 to 2%. The low amount of additional retention recommended is a due to the low availability of old structure combined with a high level of existing retention.

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1. INTRODUCTION

1.1 BACKGROUND

Recently, the Provincial Chief Forester has delivered new allowable annual cut (AAC) determinations in several BC Interior Timber Supply Areas (TSAs) to address the Mountain Pine Beetle (MPB) infestation. The Ministry of Environment (MOE) is concerned that the level of planning required to address risks to non-timber values is insufficient given the elevated harvest levels. Thus, the MOE commissioned this project to collate data to develop a forest retention framework to assist resource managers in forest-level planning.

This project is initially focusing on three Management Units (MU): Vanderhoof Forest District, Quesnel TSA, and Merritt TSA. As part of the Timber Supply Review (TSR) process in the Vanderhoof Forest District and Quesnel TSA, 12% of additional retention was assumed to address non-timber values. The additional retention was to be supplementary to the 7% level of retention in existing wildlife tree patches, riparian and old growth management strategies. The AAC determination for Merritt did not assume an elevated level of retention. In addition, no land use plan or protected area strategy exists for the Merritt TSA.

Due to differences in the MUs selected, the MOE anticipates differences in methodology and outcomes. It is also anticipated that the three management units will be used as benchmarks to apply in similar regions in the province.

1.2 PROBLEM STATEMENT

The MOE seeks to identify retention priorities within the Merritt TSA to assist managers in forest level planning. To minimize negative impacts on the forest sector, the process to select draft retention areas should be established using sound ecological criteria, while attempting to minimize the affect on the THLB.

1.3 OBJECTIVES

The main objectives of this project are to:

1. Develop and document a planning framework to identify priority areas for retention based upon sound ecological principles that are widely applicable and incorporate local information.
2. Develop *draft* retention priorities within the Merritt TSA for consideration in future planning.

These areas will provide a starting point for further discussions regarding landscape-level retention planning across the TSA. The MOE determined that draft areas identified during the project will represent an initial summary of MOE's priorities for management, and not necessarily reflect the interests of all TSA stakeholders.

1.4 TERMS OF REFERENCE

This project was completed by Dan Erikson from J.S. Thrower & Associates and David Caswell (subcontractor). The project was completed under sub contract to Forsite Consultants Limited for Colene Wood of MOE, Ecosystems Branch. Michael Burwash and Doug Lewis of MOE, Kamloops Region, were the technical contacts for this project. Project funding was provided by Forests for Tomorrow (FFT).

2. METHODS

2.1 STUDY AREA

The Merritt TSA includes 1.13 million hectares of land distributed across five natural disturbance types (NDT). The TSA borders the coastal mountain range and extends into the dry arid grasslands of the BC Interior. The TSA contains a wide variety of natural resource opportunities including forest products, mineral, wildlife, recreation, and tourism values.

Licensees include Weyerhaeuser Industries Ltd., Tolko Industries Ltd., BC Timber Sales (BCTS), Aspen Planers Ltd., Ardew Wood Products Ltd., Stuwix Resources Ltd., and Qwaeet Forest Products. For the past five years, pine beetle salvage has been the focus of harvest priorities throughout the TSA. On July 1, 2005, the chief forester determined an AAC of 2,814,171 m^3 in the Merritt TSA. This included an uplift of nearly 1 million m^3 to address the growing impacts of MPB infestation. Small-scale salvage and Non-Renewable Forest Licenses (NRFLs) are significant operators in the TSA.

Eight Indian Bands are active participants in the TSA including the Upper Similkameen Indian Band, Lower Similkameen Indian Band, and Lower Nicola Indian Band, as well as the Coldwater Indian Band, Cook's Ferry Indian Band, Nooaitch Indian Band, Shackan Indian Band, and Upper Nicola Indian Band which are current members of the Nicola Tribal Association (NTA).

The Nicola Similkameen Innovative Forestry Society (NSIFS) are actively involved in resource management in the TSA. The NSIFS is currently developing a process that incorporates both ecological and cultural information into a geographical information system (GIS) platform including a PEM, Stream Classification Model, Structural Stage, and many draft ecological and cultural species models. The First Nations Communities and forest licensees collaborated in the creation of this data, making it well understood by many of the TSA stakeholders.

An Old Growth Management Area (OGMA) selection process is currently underway in Merritt. Stakeholders involved in this process included local First Nations communities, forest licensees, MOE, and MOF. Although this process is ongoing, draft OGMAs are available at this time.

2.2 METHODOLOGY APPROVAL AND STAKEHOLDER CONTACT

The proposed methods for this project were submitted for review on November 16, 2005. Initially, stakeholder input was solicited in order identify retention priorities incorporating a range of non-timber values. Stakeholder contact was initiated on November 25 using the list of stakeholders included in the proposed methods. Stakeholder interest at this stage of the project was limited, and sufficient time was not available to ensure proper consultation. Following review by MOE and implementation contract monitors it was recommended the project strictly focus on ecological values to drive retention priorities. The original methodology was amended and resubmitted on January 11, 2006 (Appendix V). The proposed framework has been developed to efficiently incorporate stakeholder input in future processes.

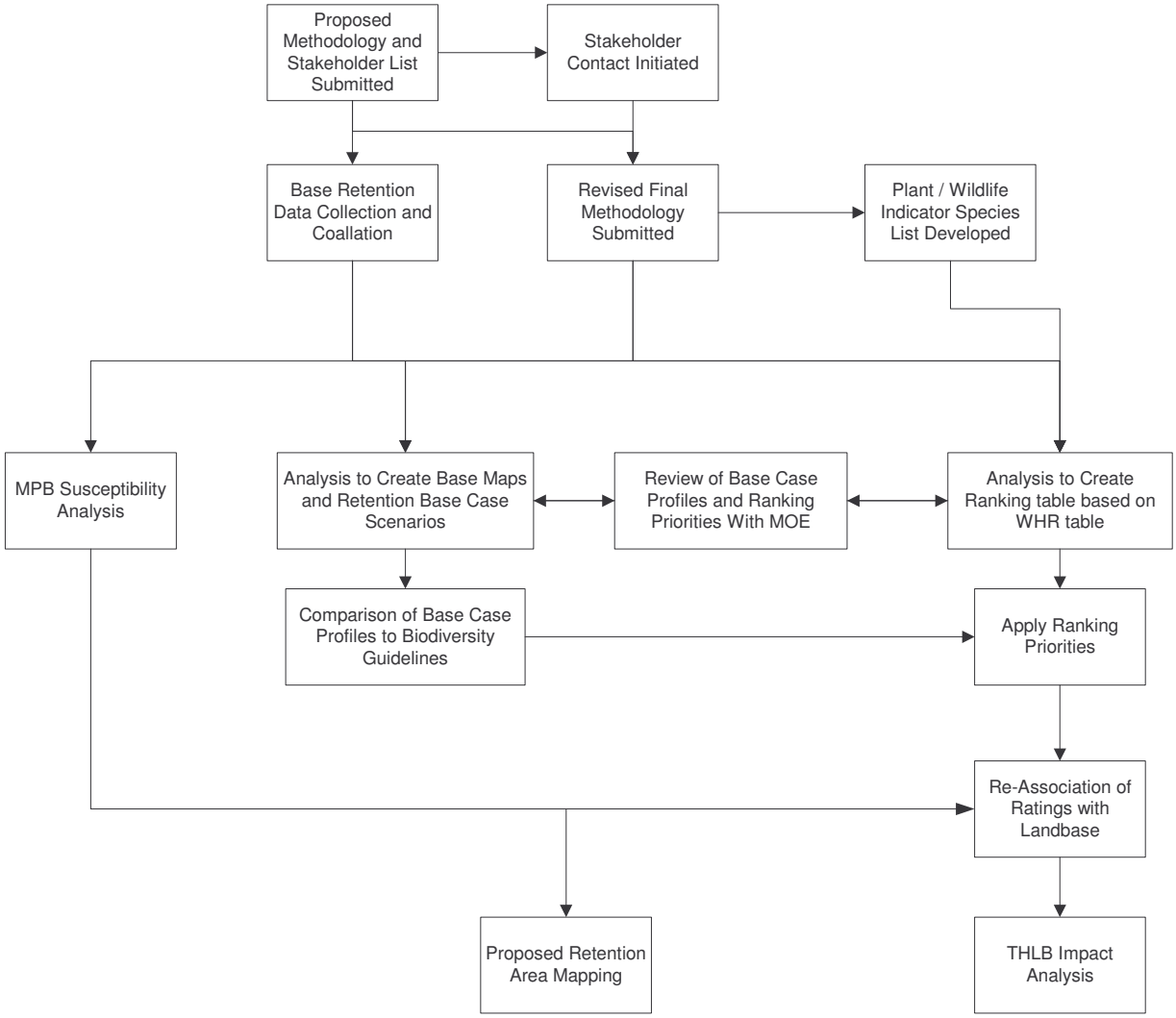

Figure 1. Proposed framework for identifying retention priorities in the Merritt TSA

2.3 DATA

2.3.1 Sources of data

Existing spatial data were used to delineate the THLB and retention areas within the TSA. The TSR dataset used was created by Timberline Forest Inventory Consultants for the NSIFS uplift application completed in 2005. This dataset was also used initially for the most recent TSR analysis, and therefore the most applicable dataset available for this project.

Table 1 contains a list of all input datasets and their application within the project.

Table 1. Input dataset descriptions and sources.

Dataset	Description	Source	Application
TRIM	Base information for mapping	ILMB	-Information for base mapping
VRI	Vegetation information	LRDW	-Analysis to create MPB susceptibility maps -Identification of water features (swamps lakes etc.) for base mapping
TSR	Timber supply review dataset developed for NSIFS uplift application	NSIFS – dataset created by Timberline	-Identity THLB vs non-THLB for analysis -Identify retention categories within non-THLB for base mapping
WCP_WHAPLY.SHP	Wildlife habitat areas	LRDW	-Identify WHAs for analysis and base maps
Various ratings tables	Draft ecology models for various wildlife and plant species – imported as ratings tables	NSIFS – created by various sub-contractors	-Priority ranking consideration for polygon species values
PEM	Predictive Ecosystem Mapping	NSIFS – spatial data created by JST/Keystone*	-Used with Structural Stage as a base to create base case retention summaries, and later to re-associate ecosystem ratings with the landbase -BEC classification within PEM used to determine NDT boundaries for analysis groupings
MTSA_STRCT.E00	Structural Stage Mapping	NSIFS – created by Keystone	-Used with the PEM as a base to create base case retention summaries and later to re-associate ecosystem ratings with the landbase
TOGMA_TME.EOO	Draft Ogmas for Merritt TSA	SIR FDP best known site	-Identify OGMA areas for analysis of retention base case scenario and base mapping
MERRITT_TSA_GOAT.SHP MERRITT_TSA_SHEEP.SHP MERRITT_TSA_MOOSE.SHP	Ungulate Winter Range Mapping	MOE	-Datasets defining ungulate winter range management areas
DMEDWR_V1_NV.EOO MDPC_FIN05.E00 SUIT_TME_V2.E00	Mule Deer Winter Range Information	MOE – via env ftp	-Mule deer winter range suitability and planning areas
TPAS_BC.E00	BC Protected Areas	MOE – via Parks ftp	-Identification of protected areas to ensure inclusion in TSR dataset and for base mapping
Cascades_SAR.mdb	Species at Risk list	Forsite - FTP	-List of species at risk within Cascades FD. Aid in selection of indicator species
AVQO_TME	Visual Quality Objectives	SIR FDP best known site	-identify VQO areas across the landscape
Community Watersheds	Community Watershed Boundaries	LRDW	-identity Community Watershed areas

2.3.2 Dataset considerations

The order in which net-downs were applied in the TSR dataset impacted the existing retention area classification of this project. The following list shows the order of area reductions applied in TSR analysis.[1]

- Non-crown
- Non-forest, non-productive, non-commercial
- Parks, ecological reserves
- ESAs
- Unstable terrain
- Problem forest types
- Cultural heritage resources
- Riparian management areas
- Hudson's Bay trail
- Water intakes for community watersheds
- Existing roads, trails and landings
- Wildlife tree patches

Structural stage information was based on an algorithm created by ECO-concepts Ecological Services Ltd. This algorithm was applied to the 2001 Vegetation Resources Inventory (VRI) dataset by Keystone Wildlife Research Ltd. Although the VRI has since changed, this data represents the best available TSA data. Criteria for classification of the various structural stages can be found in the Structural Stage Algorithm report[2].

The most recent TSA boundary was used in the creation of the structural stage dataset. The pre-existing Predictive Ecosystem Mapping (PEM) dataset was created using an earlier boundary resulting in small inconsistencies in the edge, and areas of incomplete data. These areas (<1% of the landbase) were dropped from the analysis, as both PEM and structural stage data were required for the proposed approach.

Draft ecological species models received from the NSIFS are in the process of being field validated. Species models are based on an earlier version of PEM containing some PEM entity number codes instead of all the standard two letter codes present in the final PEM created for the NSIFS. For this reason, modeling and ratings tables used this earlier PEM version.

The 1990 Biogeoclimatic Ecosystem Classification (BEC) was used as it is the classification used in PEM dataset, which formed the basis of landbase analysis.

Non-Crown land, including Private, Indian Reserve, Federal Reserves, TFL, Woodlots, and other miscellaneous categories were included in the base case retention scenarios as part of the non-THLB. This area was included in the landbase summaries to provide a better representation of available habitat.

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[1] Innovative Timber Supply Analysis Information Package, Timberline 2003

[2] Structural Stage Algorithm for the Merritt TSA, ECO-Concepts Ecological Services 2001

2.4 ANALYSIS

2.4.1 Existing Retention Collation

The analysis combined spatial information to create base case summaries of legislated retention within the TSA. Based on the proposed methodology, two categories of base case summaries were to be created; areas with complete retention and areas with partial retention or special management considerations such as ungulate winter ranges (UWR) or visual quality objectives (VQO). Upon review, the data showed that the special management areas completely covered the TSA, and that creating retention profiles for this scenario would result in a summary of the entire landbase. Furthermore, many of the special management considerations did not contain specific numbers regarding retention levels. Many of these datasets provide guiding principles to be applied on a site by site basis. For these reasons, the partial retention or special management retention scenarios were not used in the base case summaries.

All non-THLB was incorporated in existing retention mapping profiles to provide a more accurate portrayal of available habitat. Contribution classes within the TSR dataset were selected where the contributing area was equal to zero. Table 2 lists the contribution classes included from the TSR, and additional data added to create the base case dataset.

Individual retention datasets listed in Table 1 were checked to ensure inclusion within existing classification. Draft OGMAs and additional Wildlife Habitat Areas (WHA) were added to the TSR retention dataset and included on the retention base maps.

Once the base maps showing all retention types and their distribution across each landscape unit were completed, a second round of mapping was completed depicting the distribution of structural stages across the landscape. These were completed at the smallest scale possible while not decreasing the readability of the maps to minimize the number of maps. Four maps showing this information were completed at 1:100,000 scale.

Table 2. Base case retention scenario input data.

TSR Contribution Class Code	Description
ARCHA	Known archaeological sites
ALMZ	Lake Management Zone A
BLMZ	Lake Management Zone B
CLMZ	Lake Management Zone C
DLMZ	Lake Management Zone D
ELMZ	Lake Management Zone E
CMWIN	Community watershed intake
ESA1S	Environmentally sensitive areas
FROGS	Tailed frog WHA
HARVE	Harvested opening
HBTTR	Hudson bay trail
INOPR	Inoperable
L1RMA	RMA Lake Class 1
L2RMA	RMA Lake Class 2
L3RMA	RMA Lake Class 3
L4RMA	RMA Lake Class 4
NCOMM	Non-commercial forest types
NCRWN	Non-crown land
PARKS	Park/PA
PFT1	Problem forest type - poor conifer sites
PFT2	Problem forest type - deciduous leading
PFT3	Problem forest type - poor Py, Lw sites
PFT4	Problem forest type - poor young Pl sites
PFT5	Problem forest type - poor old Pl sites
PFT6	Problem forest type - poor Bl, Sx, Hw, Cw sites
S1RMA	RMA S1 stream
S2RMA	RMA S2 stream
S3RMA	RMA S3 stream
S4RMA	RMA S4 stream
S5RMA	RMA S5 stream
S6RMA	RMA S6 stream
W1RMA	RMA Wetland Class 1
W2RMA	RMA Wetland Class 2
W3RMA	RMA Wetland Class 3
W4RMA	RMA Wetland Class 4
W5RMA	RMA Wetland Class 5
Old Growth Management Areas	
OGMA = Y	Current draft OGMA areas
Wildlife Habitat Areas	
All polygons	Additional Wildlife Habitat Areas

2.4.2 Base Case Retention Summaries

Base case scenario tables and graphs were created to depict profiles of structural stage and moisture regime by area both within retention areas and across the landbase. All retention and non-THLB areas were dissolved together, overlaid with structural stage, PEM, and landscape units to create a resultant dataset. This resultant dataset was unloaded and analyzed a-spatially to create summaries by landscape unit and by natural disturbance type of the representation of stand structure and moisture regime within legislated retention/non-THLB as compared to the entire landbase. These profiles were created both as a sum of area, and as a percentage of total available area within each type. Appendix VI includes examples of each type of graph. All graphical and tabular summaries can be found on the CD included with the report.

Initial priorities for retention area selection were guided by comparing Biodiversity Guidebook recommendations on structural stage distribution to structural stage retention profiles created for the Merritt Landbase.[3] Structural stages were grouped into early, mature and old structural stages based on the following scheme:

- Early Structure – structure stages 1-3
- Mature Structure – structure stages 4-6
- Old Structure – structure stage 7

To further evaluate existing retention, moisture profiles were analyzed to determine if a desired distribution was present within existing retention. Limitations in structural stage representation or moisture regime distribution were targeted for further retention within each LU and NDT.

2.4.3 Habitat Priorities

A ranking table was used to identify priority habitat types for additional retention. This ranking table was based on the Wildlife Habitat Rating (WHR) table developed by the NSIFS[4]. The NSIFS ratings table was modified to summarize ecological units and stand structure by LU and NDT as well as summarize habitat availability and existing levels of retention.

In total, 27 plant and wildlife suitability models were incorporated in the ranking table. The criteria for habitat model selection are presented in Appendix I, with the list of selected models presented in Appendix II. Red and blue listed plant communities were also identified in the ranking table. Site ranking was based on:

- provincial listing (plant communities),
- combined suitability of habitat models,
- landbase area representation by habitat type
- existing retention level

The completed ranking table was used as a lookup table to re-associate the habitat priorities back with the landbase. A detailed summary of criteria for ranking retention priorities is presented in Appendix III.

[3] Biodiversity Guidebook 1995.

[4] Wildlife Habitat Ratings Website: http://srmwww.gov.bc.ca/wildlife/whr/sta.html.

2.4.4 THLB Impact Analysis

Although existing retention profiles were used to identify retention priorities, site selection based on ecological and inventory site characteristics may result in overlap with existing retention. Habitat priority areas were overlaid with THLB to determine spatial impacts.

2.4.5 Mountain Pine Beetle Susceptibility Analysis

Susceptibility maps were created following the general methodology created by Craig Delong (Craig Delong, personal communication, January 20 2006). These maps classified the TSA into three zones. These zones were:

- Zone 1 – Pine leading stands over 20 years projected age, not within 200m of a viable non-pine seed source (("SPC_1" = 'PL' OR "SPC_1" = 'PLI' OR "SPC_1" = 'PY') AND ("PROJ_AGE" > 20))
- Zone 2 – Non-pine leading stands (("SPC_1" <> 'PL' AND "SPC_1" <> 'PLI' AND "SPC_1" <> 'PY'))
- Zone 3 – that portion of pine leading stands that is within 200m of a viable non-pine seed source (200m Buffer of (("NPD_DESCRP" = ' ') AND ("SPC_1" <> '') AND ("SPC_1" <> 'PL' AND "SPC_1" <> 'PLI' AND "SPC_1" <> 'PY') AND ("PROJ_AGE" > 60)))

Only zones 1 and 3 are shown on final proposed retention mapping, as zone 2 is all other area.

3. RESULTS AND DISCUSSION

3.1 NDT2

In the NDT2, old structure is limiting in all LUs. The percent of available old structure in the Coldwater, Similkameen, Smith-Willis, and Tulameen LUs is below the low biodiversity recommendations. The percent of available old structure in the Tulameen LU is slightly lower than the high biodiversity recommendation. The level of existing retention of old structure in the NDT 2 ranges from 9 % in the Similkameen to 63% in the Spius LU (Table 3). Based on the high representation of mature structure in the NDT2; the low availability of old structure is likely due to the age definition which classifies old structure as being greater than 250 yrs.

Retention priorities for old structure in the NDT2 are identified for all represented LUs. Levels of proposed retention are 5% for the Coldwater, 48% for the Similkameen, 5% for the Spius, and 2% for the Tulameen LUs. The disproportionate level of retention applied to the Similkameen is attributed to the small area of NDT2 and the low level of existing retention. While the amount of old structure in the Tulameen is near the high biodiversity recommendation, retention priorities were established to compensate for the age of the data and to provide management priorities moving forward. Appendix IV outlines the habitat and wildlife priorities identified for the NDT2.

The high level of mature structure would suggest that past harvesting activity in the NDT2 has been limited. Nonetheless, future recreational, mining or forest harvesting developments may have significant impacts considering the limited area of NDT2 in the TSA. Eight priority habitats types were identified in the NDT2. Xeric and hygric moisture regimes composed a majority of habitat types prioritized at 3 and 4 types respectively. In terms of susceptibility, xeric sites likely present the greatest conflict in managing mountain pine beetle. While no lodgepole pine (Pl) leading stands were prioritized; minor components of Pl will be common across this site type. Appendix IV outlines the habitat type priorities identified for the NDT2.

3.2 NDT3

In the NDT 3, the percent available old structure in Otter and Summers is below the low biodiversity recommendations, while the Coldwater, Hayes, McNulty, and Tulameen are below the high biodiversity recommendations. Old structure in the Upper Nicola LU is at the high biodiversity recommendation. The level of existing retention of old structure ranges from 15 to 30%. The percent available mature structure in the Smith-Willis and Spius LUs is lower than the high biodiversity recommendation. Mature structure in the Similkameen LU is at the high biodiversity recommendation. Limiting structural stages in the NDT3 are likely due to past natural disturbance combined with recent harvesting activity. Landscape units where mature structure is limiting may have had the most "recent" fire disturbance compared to LUs where old structure is limiting. Subsequent forest harvesting may have further reduced structural stages limited by historical disturbance patterns. Age class definitions for NDT3 may also have some influence on the available old structure which is classified as greater than 140 yrs.

Retention priorities for old structure in the NDT3 are identified for the Coldwater, Hayes, McNulty, Otter, Summers, Tulameen, and Upper Nicola LUs. The levels of additional retention of old structure in these LUs ranges from 5-10%. Retention priorities for mature structure in the NDT3 are identified for the Similkameen, Smith-Willis, and Spius LUs. Additional retention levels of 7% have been identified for these LUs. While a few LUs containing NDT3 are near the high biodiversity recommendations, retention priorities were established to compensate for the age of the data and to provide management priorities. No additional retention is proposed in the Lower Nicola and Swakum as these LUs are above the high biodiversity recommendations for structural stage distribution. Appendix IV outlines the habitat and wildlife priorities identified for the NDT 3.

Mtn. pine beetle susceptibility is the greatest in the NDT3. Subsequently salvage harvest will have the greatest impact in this type. For LUs where old structure was considered limiting, 25 habitat types were prioritized. Hygric and mesic moisture regimes composed a majority of the habitat types prioritized at 10 and 9 types respectively followed by xeric sites at 6. Of the 25 priority habitats, 7 were Pl leading with 4 mesic and 3 xeric types. Of the Pl leading habitat types, one of the xeric types was provincially Blue listed (ESSFdc2) (BC Conservation Data Center 2006). For LUs where mature structure was considered limiting 21 habitat types were prioritized. Xeric and hygric moisture regimes composed a majority of the habitat types prioritize at 8 each followed by mesic with 5 types. Of the 21 priority habitats, 6 were Pl leading with 5 xeric and 1 mesic types. One of the xeric habitat types was provincially Blue listed (ESSFdc2) (BC Conservation Data Center 2006).

While a majority of the habitat types prioritized were not Pl leading; Pl will likely make be a minor component throughout a majority of priority habitat types and through the range of moisture regimes. Protecting non-timber values in the NDT3 presents a difficult planning challenge for resource managers. In general, retaining non-susceptible species should be a primary objective for all of the priority habitat types. In addition strategic harvesting may be directed towards reducing susceptibility and risk surrounding provincially listed habitat communities. Appendix IV outlines the habitat type priorities identified for the NDT 3.

Based on their structural stage distributions no additional retention priorities were identified in the Swakum and Lower Nicola LUs. It is assumed that the flexibility in the structural stage profile will

accommodate the age of data and the elevated salvage harvest levels. While no landscape level retention priorities were identified, it does not lower the significance of stand level retention strategies aimed at protecting non-timber values. Structural stage profiles may be re-evaluated as updates are made to vegetation data.

Taking into account the age of the data the greatest concern may be placed on LUs where mature structure is limiting. Continued salvage harvesting in these LUs may begin to negatively impact the structural stage distribution and biodiversity. Furthermore, the low availability of mature structure may have long-term biodiversity impacts as future old growth recruitment is hindered.

3.3 NDT4

In the NDT4, the percent available old structure is below the low biodiversity recommendations for all LUs. Based on the high representation of mature structure in the NDT4 in most LUs; the low availability of old structure is likely due to the age definition which classifies old structure as being greater than 250 yrs. The Upper Nicola is an exception to the other LUs where a large amount of early structure is represented by extensive natural grasslands. The level of existing retention of old structure ranges from 39 to 82 percent.

Retention priorities for NDT 4 are proposed for all LUs. The level of additional retention ranges from less than 1 to 2% of the old structure. In all LUs additional habitat priorities for mature structure were identified to accommodate the low availability of old structure. The low levels of additional retention in general and in the Smith-Willis and Upper Nicola LUs specifically is due to the low availability of old structure combined with the high level of existing retention in the NDT4 (Table 3). In the NDT4, 30 habitat types were prioritized. Considering the representation of habitat types by moisture regime, 15 habitat types prioritized were hygric, followed by mesic and xeric at 8 and 7 types respectively. In terms of susceptibility none of the habitat types prioritized were Pl leading. Nonetheless, Pl will be a common subdominant species, particularly in mesic to hygric moisture regimes of the IDFdk subzone which will present a significant planning challenge for resource management in the NDT4. As such a majority of habitat priorities were identified in the IDFdk. Harvest strategies should be tailored towards retaining non-susceptible species and directing harvest to lower risk surrounding priority habitats. Salvage harvest of Pl may have benefits by releasing non-susceptible residuals potentially recruiting habitats with old structural features regardless of age class. Habitat types prioritized for retention are presented in Appendix IV.

Table 3. Percent Structure Stage Distribution for the Merritt TSA.

	NDT2			NDT3			NDT4		
	Early	**Mature**	**Old**	**Early**	**Mature**	**Old**	**Early**	**Mature**	**Old**
Biodiversity Guidebook	Na – L <36 – I <27 – H	>16 – L >31 – I >47 – H	>9 – L >9 – I >13 – H	Na – L <46 – I <35 – H	>14 – L >25 – I >37 – H	>14 – L >14 – I >21 – H	Na – L <30 – I <23 – H	>17 – L >34 – I >51 – H	>13 – L >13 – I >19 – H
Coldwater	27 (66)	65 (54)	6 (47) **(5)**	23 (44)	57 (25)	18 (30) **(7)**	30 (64)	63 (37)	2 (51) **(2)**
Hayes	none	none	none	21 (11)	60 (9)	17 (16) **(5)**	37 (68)	58 (33)	2 (82) **(1)**
Lower Nicola	15 (58)	85 (40)	0	20 (40)	44 (13)	32 (22)	26 (46)	66 (52)	8 (50) **(2)**
McNulty	none	none	none	20 (14)	57 (5)	20 (22) **(5)**	31 (72)	60 (62)	9 (39) **(1)**
Otter	none	none	none	38 (12)	49 (15)	12 (22) **(10)**	30 (58)	66 (40)	2 (66) **(2)**
Similkameen	7 (100)	86 (46)	7 (9) **(48)**	26 (12)	37 (11) **(7)**	34 (25)	27 (38)	58 (32)	5 (66) **(2)**
Smith - Willis	none	none	none	29 (13)	30 (8) **(7)**	38 (21)	33 (63)	62 (39)	2 (74) **(<1)**
Spius	27 (63)	67 (40)	5 (63) **(5)**	32 (24)	33 (27) **(7)**	32 (27)	33 (41)	62 (35)	2 (70) **(2)**
Swakum	none	none	none	21 (12)	50 (9)	25 (20)	32 (83)	56 (39)	4 (74) **(1)**
Summers	none	none	none	21 (9)	61 (5)	13 (19) **(5)**	33 (57)	57 (32)	5 (74) **(2)**
Tulameen	28 (63)	60 (55)	12 (51) **(2)**	21 (22)	61 (18)	17 (34) **(6)**	13 (71)	83 (42)	2 (77) **(1)**
Upper Nicola	none	none	none	26 (18)	47 (12)	21 (15) **(5)**	63 (96)	33 (48)	1 (49) **(<1)**

** L, I, H refers to the Low, Intermediate and High biodiversity recommendations for percent structural stage distribution in the Biodiversity Guidebook. Values in the Biodiversity Guidebook row are an average of the BEC units represented in the Merritt TSA. Early structure category is composed of structural stages 1-3, with mature structure category composed of structural stages 4-6 and old composed of structural stage 7. Where the percent structural distribution does not equal 100, the remaining percentage is in unclassified structure. Non-bolded values in brackets are the percent area in existing retention. Shaded cells indicate structural stages targeted for additional retention. Bolded value in brackets at the bottom of the cell is the additional % area (by NDT) proposed for retention.

3.4 THLB ANALYSIS

THLB analysis identified areas already contained within existing retention or non-THLB classification. Table 4 and Table 5 show the impact on THLB for each combination of NDT, LU, and retention priority rank. The majority of recommended retention areas are within the THLB, as priorities selected for ecosystem and stand types under-represented in existing retention/non-THLB. Impact on the THLB was minimized by setting priorities based on perceived limitations, rather than adding retention at a static level across the TSA. Several LUs in the NDT2 and NDT4 do not have additional recommended retention for this reason.

Table 4. THLB impact in hectares by LU, NDT, priority ranking.

		RANK 1		RANK 2		RANK 3		All RANKS		Grand Total
NDT	LU	non-THLB	THLB	non-THLB	THLB	non-THLB	THLB	non-THLB	THLB	
2	Coldwater	0.73	10.76	47.77	235.73	208.10	458.22	256.61	704.71	961.32
	Similkameen			1.19	35.63	59.13	215.95	60.32	251.57	311.89
	Spius					403.47	1154.67	403.47	1154.67	1558.14
	Tulameen					822.55	1118.22	822.55	1118.22	1940.77
Total Area for NDT 2		*0.73*	*10.76*	*48.96*	*271.36*	*1493.25*	*2947.05*	*1542.95*	*3229.17*	*4772.12*
3	Coldwater	171.17	620.19	69.01	246.61	206.61	572.75	446.80	1439.55	1886.35
	Hayes	184.66	284.70	112.21	2383.29	12.54	577.52	309.42	3245.51	3554.93
	McNulty	100.34	208.67	109.87	1077.72	40.36	698.60	250.57	1984.98	2235.56
	Otter	152.81	596.77	16.28	220.03	97.61	1331.10	266.70	2147.90	2414.60
	Similkameen	420.12	896.39	24.24	338.64	133.72	3166.93	578.08	4401.96	4980.04
	Smith-Willis	76.09	455.84	232.06	1443.37	84.10	1104.84	392.24	3004.05	3396.29
	Spius	232.53	409.35	345.02	952.37	38.13	626.59	615.68	1988.31	2604.00
	Summers	41.61	187.83	12.17	522.79	18.56	584.19	72.34	1294.82	1367.16
	Tulameen	54.07	106.65	272.43	864.95	710.09	2273.74	1036.58	3245.34	4281.92
	Upper Nicola	140.39	647.70	193.05	1209.21	28.31	169.70	361.74	2026.61	2388.35
Total Area for NDT 3		*1573.80*	*4414.08*	*1386.33*	*9258.98*	*1370.04*	*11105.97*	*4330.16*	*24779.03*	*29109.19*
4	Coldwater	5.48	101.14	44.64	294.60	815.78	1315.58	865.90	1711.31	2577.21
	Hayes			22.17	170.20	466.65	376.34	488.82	546.54	1035.36
	Lower Nicola	17.90	42.04	39.30	137.15	1156.36	1085.43	1213.56	1264.62	2478.17
	McNulty			6.45	178.24	363.83	475.48	370.27	653.72	1024.00
	Otter	1.20	30.91	0.13	16.20	1459.18	1719.41	1460.51	1766.52	3227.03
	Similkameen	6.01	37.07			1077.93	1366.31	1083.94	1403.37	2487.31
	Smith-Willis	9.13	13.73	16.44	466.48	1927.96	1662.92	1953.53	2143.13	4096.65
	Spius	61.94	55.61	63.27	64.27	396.95	499.81	522.16	619.70	1141.85
	Summers			7.09	135.53	705.54	952.19	712.62	1087.71	1800.34
	Swakum	10.34	71.48			1139.96	828.77	1150.30	900.25	2050.55
	Tulameen					292.88	216.09	292.88	216.09	508.97
	Upper Nicola					28.37	469.25	28.37	469.25	497.63
Total Area for NDT 4		*111.99*	*351.97*	*199.49*	*1462.66*	*9831.39*	*10967.58*	*10142.87*	*12782.21*	*22925.08*
Grand Total		*1686.52*	*4776.81*	*1634.78*	*10993.00*	*12694.68*	*25020.60*	*16015.97*	*40790.41*	*56806.39*

Table 5. THLB Impact (%) by LU, NDT, priority ranking

		RANK 1		RANK 2		RANK 3		All RANKS	
NDT	**LU**	**non-THLB**	**THLB**	**non-THLB**	**THLB**	**non-THLB**	**THLB**	**non-THLB**	**THLB**
2	Coldwater	6.36%	93.64%	16.85%	83.15%	31.23%	68.77%	27%	73%
	Similkameen			3.23%	96.77%	21.50%	78.50%	19%	81%
	Spius					25.89%	74.11%	26%	74%
	Tulameen					42.38%	57.62%	42%	58%
% for NDT 2		*6.36%*	*93.64%*	*10.04%*	*89.96%*	*30.25%*	*69.75%*	*28.58%*	*71.42%*
3	Coldwater	21.63%	78.37%	21.87%	78.13%	26.51%	73.49%	24%	76%
	Hayes	39.34%	60.66%	4.50%	95.50%	2.13%	97.87%	9%	91%
	McNulty	32.47%	67.53%	9.25%	90.75%	5.46%	94.54%	11%	89%
	Otter	20.39%	79.61%	6.89%	93.11%	6.83%	93.17%	11%	89%
	Similkameen	31.91%	68.09%	6.68%	93.32%	4.05%	95.95%	12%	88%
	Smith-Willis	14.30%	85.70%	13.85%	86.15%	7.07%	92.93%	12%	88%
	Spius	36.23%	63.77%	26.59%	73.41%	5.74%	94.26%	24%	76%
	Summers	18.14%	81.86%	2.27%	97.73%	3.08%	96.92%	5%	95%
	Tulameen	33.64%	66.36%	23.95%	76.05%	23.80%	76.20%	24%	76%
	Upper Nicola	17.81%	82.19%	13.77%	86.23%	14.30%	85.70%	15%	85%
% for NDT 3		*26.59%*	*73.41%*	*12.96%*	*87.04%*	*9.90%*	*90.10%*	*14.61%*	*85.39%*
4	Coldwater	5.14%	94.86%	13.16%	86.84%	38.28%	61.72%	34%	66%
	Hayes			11.52%	88.48%	55.36%	44.64%	47%	53%
	Lower Nicola	29.86%	70.14%	22.27%	77.73%	51.58%	48.42%	49%	51%
	McNulty			3.49%	96.51%	43.35%	56.65%	36%	64%
	Otter	3.73%	96.27%	0.80%	99.20%	45.91%	54.09%	45%	55%
	Similkameen	13.95%	86.05%			44.10%	55.90%	44%	56%
	Smith-Willis	39.92%	60.08%	3.40%	96.60%	53.69%	46.31%	48%	52%
	Spius	52.69%	47.31%	49.61%	50.39%	44.26%	55.74%	46%	54%
	Summers			4.97%	95.03%	42.56%	57.44%	40%	60%
	Swakum	12.64%	87.36%			57.90%	42.10%	56%	44%
	Tulameen					57.54%	42.46%	58%	42%
	Upper Nicola					5.70%	94.30%	6%	94%
% for NDT 4		*22.56%*	*77.44%*	*13.65%*	*86.35%*	*45.02%*	*54.98%*	*42.26%*	*57.74%*
% for all NDTs		*26.09%*	*73.91%*	*12.95%*	*87.05%*	*33.66%*	*66.34%*	*28.19%*	*71.81%*

3.5 MOUNTAIN PINE BEETLE SUSCEPTIBILITY MAPPING

MPB susceptibility was identified as a secondary consideration for the Merritt MU, and therefore is shown on final maps but not included in the retention area selection process. Analysis identified approximately 35% of the TSA as susceptible to Mountain Pine Beetle (Zone 1 and Zone 3). Of this area, roughly half is located within 200 meters of a viable non-pine seed source (Zone 3).

Table 7and

Table 8 indicate that the majority of recommended retention areas (67%) do not overlap with identified susceptible areas. Both NDT2 and NDT4 contain less than 15% overlap with identified susceptible areas, with less than 5% in each type occurring in susceptibility Zone 1. Retention of mature structure in the NDT3 does present some conflicts, with 29% overlap in Zone 1 and 22% overlap in Zone 3.

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