

100 Mile House Forest District Enhanced Retention Strategy

For
Large Scale Salvage of
Mountain Pine Beetle Impacted Stands

Version 1.1

100 Mile House Forest District
Enhanced Retention Strategy Committee
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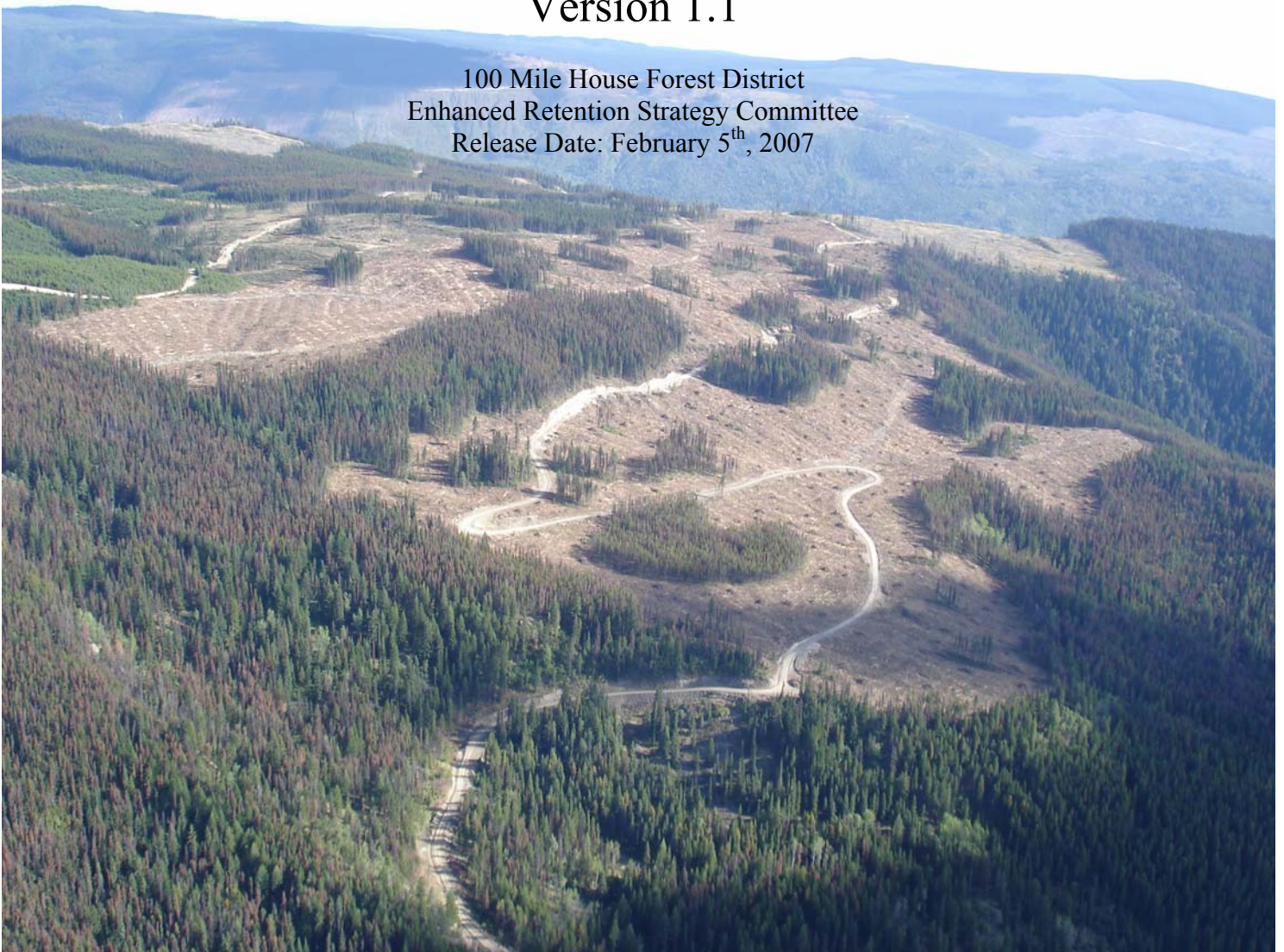


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Thank you to the committee members who have put much time and effort into developing the Retention Strategy.

Introduction

History of the Mountain Pine Beetle Infestation

The Mountain Pine Beetle (MPB) infestation in British Columbia is exceeding historical levels; and based on recent modelling 78% of the mature Lodgepole Pine forests in the province will be killed by 2015. According to aerial surveys over the last eight years, it is estimated that over 40% of this projected mortality has already occurred. It is thought that the provincial peak in annual mortality occurred in 2005, but significant mortality is expected until 2009 at which time annual mortality is expected to drop drastically. This is largely due to the fact that much of the mature pine component in British Columbia's central interior forests will have already been killed.

There is substantial variation in the timing and magnitude of the peak in annual kill in different management units throughout the province. 100 Mile House probably experienced its peak in annual mortality in 2006 (Forest Analysis and Inventory Branch).

The forests of the 100 Mile House Timber Supply Area (TSA) are very diverse, however, Lodgepole Pine and Douglas-Fir are the dominant species. Lodgepole Pine represents approximately 55% of the total volume within the timber harvesting land base. About 36 million cubic metres of pine volume is projected to be killed by 2015, with about 40 million cubic metres (83 percent of the susceptible pine) killed by 2026 across the TSA's timber harvesting land base.

Management Response

MPB-killed pine stands have a limited time during which one can economically recover conventional lumber from harvested logs, i.e., the "shelf life" of attacked stands. For this reason, an expedited timber supply review was conducted for the 100 Mile House TSA in 2006. The Chief Forester increased the Annual Allowable Cut (AAC) for the 100 Mile House Timber Supply Area by 666,000 m³. At that time the Chief Forester asked the Ministry of Forests and Range district staff to continue to monitor the salvage operations so that, if and when required, the determination may be revisited at an earlier date than stipulated by statute, which is every five years.

Of the entire 2.0 million m³ AAC, 1.87 million cubic metres is to be focussed on timber types with at least 70 percent pine. In the 2006 AAC Rationale for 100 Mile House TSA, the Chief Forester states *"my determination is predicated on directing approximately 90 percent of the harvest at stands with at least 70 percent pine in order to optimize salvage opportunities while reducing risk to mid-term timber supply."* Based on timber supply analysis modeling of different harvesting scenarios, focussing just some of the AAC at these stands, while harvesting in timber types with less than 70 percent pine, will have a significant, negative impact on mid-term timber supply. Identification of timber types that have less than 70% merchantable pine is crucial for a sustainable, yet maximized AAC in the mid-term.

In determining an AAC, the Chief Forester is required to consider factors in Section 8 of the *Forest Act*. One factor is: (v) *the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production*. Therefore, the Chief Forester specifically considered non-timber values. As direction for implementation, the Chief Forester states “*the substantial increase in the AAC due to this determination underscores the importance for retention planning and implementation so that non-timber values are addressed as harvest levels increase. I request that licensees work with BCFS district staff to report on retention planning and implementation efforts.*”

The Chief Forester also stated: “*Increased harvesting operations related to an increase in the AAC can lead to an increased risk to biodiversity, habitat, riparian resources, and watershed integrity. This highlights the need for increased levels of retention to reduce the negative impacts on these values that may be associated with a greater rate of harvesting. In December 2005, I provided Guidance on Landscape and Stand Level Structural Retention on Large-Scale Operations Associated with Mountain Pine Beetle Killed Timber. The guidance is intended to assist forest professionals in the planning and implementation of salvage operations. In this document I provide a recommended proportion of stand-level retention based on opening size. I encourage licensees to consider this guidance, in the development and implementation of retention plans, as they harvest the higher AAC that I have determined for this TSA.*”

Other resources include:

1. Klenner, W. 2005. Maintaining habitat structure and wildlife diversity during salvage harvesting on Mountain Pine Beetle attack areas in the Southern Interior Forest Region. Draft Version 1.0. Ministry of Forests, Southern Interior Forest Region, Kamloops, BC. http://www.for.gov.bc.ca/hfd/Pubs/RSI/FSP/EN/RSI_EN04.htm
2. Martin, Marnie. 2006. Retention measures to address ecological values in Mountain Pine Beetle affected forests in BC, A Discussion Paper with Recommendations. Version 1.0, Ministry of Environment. [http://www.for.gov.bc.ca/hfp/fft/fftreports/MPB%20-%20Salvage%20Retention%20final%20Feb%2016%20\(2\).doc](http://www.for.gov.bc.ca/hfp/fft/fftreports/MPB%20-%20Salvage%20Retention%20final%20Feb%2016%20(2).doc)
3. Eng, M. 2004. Forest stewardship in the context of large-scale salvage operations: An interpretation paper. B.C. Min. of For., Res. Br., Victoria B.C., Tech. Rep. 019. <http://www.for.gov.bc.ca/hfd/pubs/Docs/Tr/Tr019.pdf>
4. Bunnell, F.L., K.A. Squires, and I. Houde. 2004. Evaluating the effects of large-scale salvage logging for mountain pine beetle on terrestrial and aquatic vertebrates. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, British Columbia. Mountain Pine Beetle Initiative Working Paper 2004-2. 57 p. <http://www.for.gov.bc.ca/hfd/library/documents/bib92944.pdf>

These references contain a number of recommendations for possible future forest practices that might be different than current practices in light of the potential for significant harvest level increases.

Context of the Enhanced Retention Strategy

One component of the 100 Mile House Forest District Enhanced Retention Strategy is this consensus document produced by the 100 Mile House Forest District with the involvement of major licencees, British Columbia Timber Sales, First Nations and other government agencies.

The document is provided as a resource to forest managers when developing harvesting opportunities within the 100 Mile Forest District. The Strategy is not intended as policy to forest professionals, but serves to document what are currently believed to be the “Best Management Practices” to maximize the economic value of mountain pine beetle killed timber while protecting other resources and minimizing any potential reduction in the mid-term timber supply.

Under the Forest and Range Practices Act model, the document is not to be used in the evaluation of cutting permit submissions nor does it impose statutory obligations. The cutting permit issuance process will not be delayed to ensure that licensees are adhering to this document. Rather, forest professionals operating outside of this guidance do so at their own professional risk and accountability. (See Professional Reliance and Accountability)

The primary users of the Strategy are expected to be the Stewardship staff of the Ministry of Forests and Range, holders of forest tenures, and British Columbia Timber Sales development foresters. The Strategy will be used during discussions and planning of harvesting activities within the 100 Mile House Forest District with the goal of meeting government and public expectations for forest land management during a period of increased harvesting due to salvage priorities.

In keeping with the results based framework of forest management in British Columbia, professionals will assess the appropriate level of enhanced retention sufficient to protect non-timber values and promote mid-term timber supply. Retention targets to be achieved will be in the form of traditional Wildlife Tree Patches (WTP). Retention levels for actual treatments (harvesting) are reported annually by May 31st for the preceding calendar year.

The Quesnel Forest District Enhanced Retention Strategy introduced a new form of retention referred to as Conservation Legacy Areas (CLA). CLA's were considered as an option to be included in this Strategy. CLA's were viewed as a harvest deferral intended to provide enhanced protection to timber types that are either outside of the Chief Forester's direction (less than 70% pine), offered enhanced protection to marginal timber type that consisted of greater than 70% pine, or have advanced regeneration that could offer a harvest opportunity into the mid-term. CLA's would also possibly serve a greater purpose in the form on interim habitat structure for wildlife. The increased flexibility of CLA's was intended to allow forest operators access to these areas designated as CLA's in the mid-term without necessarily having to amend their Forest Stewardship Plans (FSP) to allow harvest of WTP's.

Two viewpoints were presented that influenced the decision not to implement this new form of retention:

1. Forest professionals hold firm the belief that they should follow the Chief Forester's direction and they can be held accountable for the decision to harvest these non-target timber types. As such, non-target timber types should be avoided in forest development and do not need added or enhanced protection.
2. Implementing a new form of retention will increase workload and complicate licensee reporting requirements. Licensees are apprehensive about using CLA's and therefore to ensure the consistent implementation of this Strategy by all forest professionals, CLA's will not be used as an enhanced retention designation.

The decision to develop and harvest a pre-established WTP designed to protect and conserve other societal values will be at the professional's discretion and will need to adhere to individual operator's FSP's; however, due diligence requires a very high level of professional care when the decision to develop these areas occurs. This is especially true for enhanced retention functioning as interim wildlife habitat in watersheds that have been heavily denuded. Some of this enhanced retention may be required for some time before the harvested stands in the surrounding area have recovered to the point where the interim habitat is no longer necessary.

Intent of Guidance

The Strategy's intended use is as a reference point for discussions between professionals and interested parties (e.g. Ministry of Forests and Range staff, licensee staff, First Nations, consultants, other government staff, or members of the public) on how forest management is being conducted.

This document is intended to support the goal of increasing stand level retention by providing guidance to assist forest professionals in selecting and distributing enhanced retention areas during the implementation of the large-scale salvage of MPB impacted pine leading stands within the 100 Mile House Forest District. The Best Management Practice (BMP) recommendations presented are considered to be the best non-legal direction to realize the objectives and expectations expressed by the Chief Forester in the expedited 2006 Timber Supply Review determination, while remaining consistent with the objectives and expectations of the Cariboo Chilcotin Land Use Plan (CCLUP).

This Retention Strategy will provide tools and Best Management Practices that British Columbia Timber Sales and current and future forest licence holders will use when planning large-scale Mountain Pine Beetle salvage on Crown land. Due to shelf life considerations, it will not be possible to salvage all the Mountain Pine Beetle impacted stands; therefore, it is important to plan retention to enhance value or minimize disturbance to ecological attributes. The strategic placement of this non-recoverable timber over areas of identified high values can support the objective of increased stand level retention in MPB infested pine-leading stands. In addition, mid-term timber supply has become a significant concern, so this enhanced retention planning guidance was

developed to strategically identify stands that could possibly alleviate downward pressure in the next TSR determination.

This guidance is not intended to constrain forest professionals in identifying suitable retention areas at the stand level. It provides a set of suitable recommended options with supporting spatial and temporal information to consider when engaging in forest management. The flexibility and options presented are intended to support the government initiative to increase professional reliance and accountability.

This Strategy presents the following information:

1. An independent watershed analysis will be produced and will build on watershed assessment work that West Fraser Sawmills initiated through Pierre Beaudry and Associates (to be released in Version 1.2 sometime after March 31st, 2008). To help ensure consistent use of this Strategy it is recommended that planners use the delineated watershed boundaries as a landscape planning unit to manage for cumulative effect of increased harvest levels.
2. Recommended Best Management Practices have been outlined and provide guidance on the selection of enhanced retention areas.
3. Supporting 1:15,000 maps of non-timber resource values and timber types have been produced for the entire 100 Mile House TSA (Values maps). These landscape and stand level attributes require close scrutiny by field professionals to determine the potential for contributing to enhanced retention objectives.
<http://www.for.gov.bc.ca/ftp/DMH/external/!publish/RetentionStrategy>
4. To support the Values maps, an additional mapping product (Retention Potential maps) was produced that identifies suitable areas for enhanced retention. This was a GIS exercise that assigned numerical values to forest cover polygons based on the polygons proximity to various attributes of the forest (See Appendix A).

General Best Management Practices

Best Management Practice Context

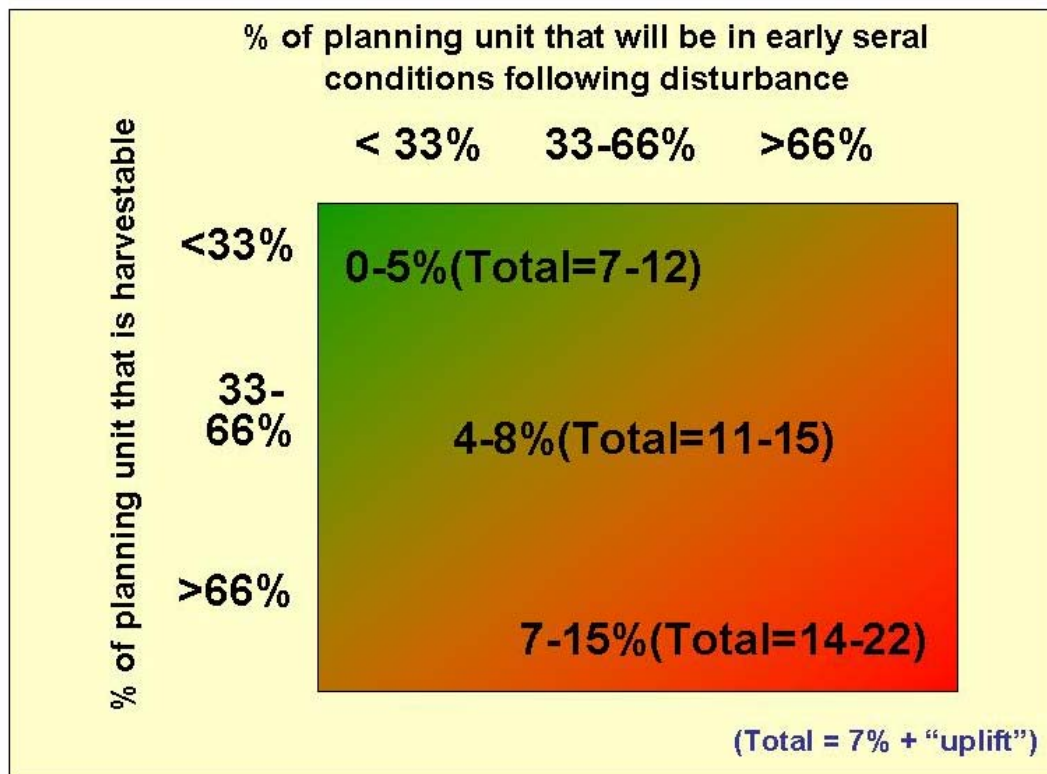
The success of this strategy to mitigate potentially negative, unplanned, cumulative effects on timber and non-timber resources associated with large-scale salvage requires a collective commitment by resource management professionals to increase retention levels on a watershed basis. Resource managers have agreed to meet annually to share information on how their individual forest operations have impacted this retention strategy and rationalize to their peers where the retention strategy is not being adhered to. Further information to be considered when planning forest development is contained in the *Summary of CCLUP Legal Requirements and Selected Non-Legal Direction* and the 100 Mile House Sustainable Resource Management Plan (SRMP) reports.

General Principles for Enhanced Retention in Areas Impacted by Mountain Pine Beetle Salvage Activities

1. The primary purpose of this strategy is to achieve enhanced landscape / watershed level retention through stand level activities. The landscape level tools developed to support this strategy will assist in knowing where the values are spread across the landscape, and the watershed assessment of 71 sub-basins within the 100 Mile House TSA will provide information on the current status of the sub-basins. This Strategy is designed to use the watershed assessments at the first stages of Crown land forest development. A forest professional has the freedom to decide what level of risk to watershed values they are willing to accept professionally and be held accountable for.
2. As per the Chief Forester's direction, the 70% pine threshold should be met by inventory polygon or timber type as identified in the field, not by blending timber types on a cutblock or cutting permit basis. The interpretations and end results between the two can be significantly different. During preliminary stages of forest development, forest inventory polygons with one or more non-pine species that have a higher volume in the inventory than the identified pine volume should be avoided in forest development.
3. Primary focus for establishing enhanced retention is on riparian retention, particularly where this supports overlap with other values such as preserving wildlife corridors, continuing patterns of forested connectivity or protecting known archaeological sites and areas of high archaeological potential.
4. Look for opportunities within cutblock boundaries to overlap retention with other relevant constraints such as archaeological potential, high risk terrain stability areas, Environmentally Sensitive (ES) areas, Conservation Data Centre (CDC) red-listed and blue-listed species locations and areas of retention consistent with CCLUP objectives.
5. Figure 1 has been included in this Strategy to demonstrate some of the principles that a forest professional considers when assessing the level of retention sufficient to protect non-timber values in landscapes heavily impacted by large scale salvage of pine. It is widely accepted and affirmed by this Enhanced Retention Strategy Committee that as the level of disturbance increases at the watershed level, either as a result of natural or manmade factors, and as the percentage of area within that watershed planning unit that is available for harvest increases, so should the level of enhanced retention over and above legislative requirements for retention.

FIGURE 1: Minimum within-stand retention objectives (% of stand volume retained) to protect wildlife habitat diversity following MPB salvage operations relative to surrounding landscape conditions (Klenner 2005, in power point presentation to Committee Nov. 16/07). To more widely disperse structure across the salvage cutblock, full rotation retention areas (e.g., WTPs) may be supplemented with partial retention cutting¹

Retention “*Uplift*” in the Context of Large - Scale Disturbance: General Principles



For purposes of enhanced retention planning, early seral should be considered as all stands less than 25 years of age regardless of previous disturbance type. An assessment of early seral should include all stands of 70% or greater pine in composition and greater than 50 years regardless of merchantability. Many of these stands have already died or are experiencing severe mortality and therefore will function ecologically similar to that as a stand in early seral condition. Despite the fact that these stands may provide some structural complexity, it is thought that it will be years before these stands return to mature or late seral functioning condition.

¹ Estimates are based on general principles of scale and the need to maintain more within-stand structure as the distance from surrounding mature forest increases. Several factors can mitigate the need for increased levels of retention in large openings (e.g., openings with complex outer boundaries, feathered edges, areas of immature forest and/or partial retention within the block boundary, and other features).

Landscape Level Management of Watersheds

- A watershed risk assessment will be completed as part of this Retention Strategy. Forest professionals will need to review the report in the Appendix once the Strategy is re-released as Version 1.2 and become familiar with the tool. A part of this risk assessment is a calculation of Equivalent Disturbed Area (EDA), which is simply a snapshot of the current state of the watersheds. Management decisions will have to consider the cumulative effects of multiple harvesting operations in a watershed in the period after this initial assessment is completed.
- Identify those watersheds that are valuable for instream resources, evaluate channel sensitivities, and manage the watersheds in the short and long-term to minimize the effects of increased peak flows.
- MPB affected watersheds or other areas of mortality should remain unharvested if it is determined by a qualified hydrologist in consideration of cumulative impacts that to harvest such areas places fish habitat and spawning areas, water quality, infrastructure, etc. at too great a risk.
- Greater levels of retention should occur at higher elevations and in those watersheds where lakes and wetlands (which buffer peak flows) are relatively fewer in number and area.

Riparian Features

It is recognized that riparian features have the highest priority for enhanced retention establishment. This is especially true in watersheds that have a large percentage of area that consists of timber types greater than 70% pine. In these watersheds it is likely that a large portion of the watershed will be harvested; therefore, it is very important that these streams are given extra consideration to protect hydrological values and to ensure adequate habitat is maintained for connectivity and for mimicking natural disturbance patterns.

- In watersheds where large openings can be expected due to limited variability in timber types or where large aggregate blocks can be expected due to total chance planning; it is recognized that there is wildlife and biodiversity values associated with retaining live and dead stand structure. In these scenarios enhanced retention is expected and retaining dead timber on all stream classes has greater value than simply leaving one large patch along the periphery of a block edge.
- Consider treating the entire Riparian Management Zone (RMZ) of all riparian features as a Riparian Reserve Zone (RRZ) and seek opportunities to increase the size where it is suitable to enhance the protection of fisheries habitat or watershed values.

- Riparian retention must be sufficient to adequately manage fish habitat, riparian habitat, water quality and stream dynamics. In addition to this retention, forest professionals should also increase retention of pine areas that contain significant green volume (any species) remaining and growing, and areas of non-pine extending into upland areas. These areas provide longer-term wildlife habitat, connectivity value, and a possible future economic harvest opportunity.
- Due to the largely unknown cumulative effects of extensive pine salvage on riparian values, give priority to enhancing current riparian protection within pine salvaged cutblocks. Of particular concern is the windfirmness of retained trees over multiple passes of pine salvage. Principles of windfirmness such as feathering of harvest edges, selecting previously wind-loaded stems for retention, wider RMZ's, and single tree selection within the WTP should be considered.
- Where high windthrow hazard exists, consider doubling the width of the riparian management area's (RMA), or widening the width of the RMA to connect to a natural windbreak, if possible. Consider 100% retention within the entire RMA unless alternative windthrow management measures are proposed.

Old Growth Management Areas (OGMA)

- Consider retaining pine leading stands with well developed advanced regeneration of preferred stems as WTP's in salvage cutblocks adjacent to current OGMA's. This is intended to enhance values associated with the OGMA and interior forest condition. Non-pine leading timber types or pine leading timber types with advanced regeneration adjacent to OGMA's should be avoided for harvest when it is determined that these types may allow future harvest opportunities in the mid term.

Non-Pine Species

Within the pine-leading landscape, there are often timber types that contain significant components of other species, either in the main canopy or intermediate layers or as understory. These types have high value for wildlife habitat and biodiversity in watershed heavily denuded and could alleviate downward pressures on mid-term timber supply. These timber types should be carefully assessed for enhanced retention, particularly when they are found within proposed harvest boundaries.

The Non Timber Values maps contained in the appendix identify those pine-leading polygons with significant volumes (greater than 30%) of other species in the inventory label. As the inventory information is only best available information and is simply a reflection of gross merchantable volume, an assessment of additional stand attributes other than merchantability is required. Where the secondary species is Douglas-Fir, Spruce, or Sub-alpine Fir the existence of an understory is considered probable.

The following BMP's provide guidance for managing these timber types:

- Timber types should be evaluated at the stand level or inventory polygon level and not at the cutblock or cutting permit level in order to avoid blending timber types. Analysis at the cutblock or cutting permit level may not accurately reflect the actual diversity present on the landscape.
- The intent is to focus enhanced retention in the pine-leading landscape which is subject to the increased salvage harvesting. Pine-leading polygons with volumes of non-pine species are of particular value for retention. WTP placement should capture pockets of un-mapped non-pine species at the stand level.
- Pine-leading polygons with significant volumes of non-pine species are some of the highest value areas for mitigating mid term timber supply falldown. Avoid harvesting timber types with significant understory or sapling/pole layers or protect these types through enhanced retention.
- Consider retaining buffers of dead pine around areas of retained non-pine species or areas of pine with sufficient green volume remaining. This will protect the values associated with these retained stands from both endemic and catastrophic windthrow.
- Consider reserving deciduous species in riparian and harvested areas. Deciduous stands are noted in the CCLUP as contributors to biodiversity, and are one of the key structural characteristics remaining in natural bark beetle disturbance patterns.

Wildlife Tree Patches

WTP's will continue to be established and managed in accordance with individual operator's FSP content.

- If a Wildlife Tree Patch associated with an older harvesting treatment is harvested during expedited Mountain Pine Beetle salvage, replacement areas will be identified in the Site Plan of the new cutblock. This replacement area should be in addition to legislative requirements and should be established consistent with the Best Management Practices presented in this Strategy.
- Wildlife Tree Patches are expected to remain on the landscape for a full rotation, except where otherwise stated in an approved FSP. Features that constrain forest development should be targeted for Wildlife Tree Patch placement.
- During Wildlife Tree Patch establishment, measures should be taken to ensure the patch remains windfirm.

- WTP's should be placed in consideration of their current and longer-term habitat value and contribution to wildlife connectivity, rather than for their similarity to the stand being harvested. Look for opportunities to add to and reinforce existing small WTP's when abutting existing blocks to improve stability and/or add interior habitat.
- WTP's should be established where wildlife features are located. Retention should be of sufficient extent to provide general habitat value as well as protect the feature where conditions and stand types permit.

Specific Wildlife Measures²

Maximum inter-WTP distances are especially important when considering enhanced thermal and visual cover for large carnivores and ungulates. It is acknowledged that the expedited salvage of MPB affected timber can result in very large, contiguous openings that offer very little visual and thermal cover. Research has also shown that smaller mammals are reluctant to utilize and cross harvested openings. Forest professionals are expected to manage the accelerated pressure that results from increased road construction densities and maintained access into and through these areas.

- To enhance wildlife values, the maximum distance from one break in line of sight to the next should be kept lower than 500 meters. In most cases, a more realistic and optimum distance in breaks of line of sight is 300 meters. WTP's used to meet this distance must be at least 0.25 hectares in size. In larger openings or in watersheds that will be heavily denuded, this maximum inter-WTP should be less.
- It is recommended that WTP's be at least 2 hectares in size to maximize value to wildlife and to allow for future rehabilitation.
- It is recognized that there is more value in retaining several dispersed, small retention areas interior to a proposed cutblock than one large retention area between multiple large openings.

Advanced Regeneration

- This Strategy is designed to protect and enhance suitable secondary structure in timber types with MPB killed timber, where it is believed there is sufficient stocking of “**suitable secondary structure**” trees with sufficient size to produce a merchantable stand sooner than if the area was clearcut and reforested. “**Suitable secondary structure**” means healthy saplings, poles, sub-canopy and canopy

² Best Management Practices are based on general principles of scale and the need to maintain more within-stand structure as the distance from surrounding mature forest increases. Several factors can mitigate the need for increased levels of retention in large openings (e.g., openings with complex outer boundaries, feathered edges, areas of immature forest and/or partial retention within the block boundary, topography, and other factors).

trees that are ecologically suited to the site, likely to survive the MPB attack and likely to grow into a merchantable stand.

- During forest development, advanced regeneration should be considered in determining if pockets of dead, merchantable pine with an understory of fully stocked advanced regeneration will contribute to mid-term timber supply. If pockets of a reasonable size are found that will facilitate future harvesting, these areas should be documented and the information provided to other forest professionals operating in the area. These stands should be avoided or reserved from harvesting.
- During harvesting operations extra effort should always be taken to protect healthy advanced regeneration regardless of stocking levels or anticipated contribution of these stems to future timber supply.

Stand Level Management of Watersheds

To mitigate the effects of the MPB infestation on water and watersheds, the following recommendations should be considered by forest resource planners where practicable:

- salvage log in stages by using a variety of cutting intensities and retention strategies, distributed over the landscape, to desynchronize runoff,
- avoid sensitive terrain and soil types and develop erosion control plans where necessary,
- minimize harvesting within riparian areas,
- maintain a diversity of cover types and minimize post-salvage reforestation delays through single tree or patch retention to protect advanced regeneration as well as non-coniferous forest vegetation,
- leave fine and coarse woody debris in openings where possible to delay surface runoff,
- develop watershed management strategies that will maintain other forest resource values,
- construct, inspect, and maintain roads to ensure natural surface and shallow subsurface drainage remain intact,
- upgrade drainage networks on permanent roads prior to salvage logging as necessary to accommodate expected increases in peak flows, and
- increase inter-agency and public communication regarding the issues, hazards, and risks in watersheds affected by MPB beginning with the identification of watersheds where downstream risks to public safety and infrastructure could be increased.

Professional Reliance and Accountability

As this is a publicly released document, it is important to describe the shift in forest management from a highly prescriptive, inflexible approach to forest management in an era of professional freedom where professionals make management decisions in the best interest of the public. It may be difficult for those that are not trained as forest professionals to understand how forest professionals can be expected to use such a Strategy when it is not enforceable. Members of the public may not realize the new role forest professionals have in British Columbia's forest management and it may seem that this Strategy will not be used or will be ignored by forest professionals.

In British Columbia, the public, which is the owner of much of the forested landbase, has granted the exclusive right to title and practice of forestry to forest professionals. It is believed that due to the complexity of forest management decisions, a high level of training, knowledge, and experience is required when making decisions. The Association of British Columbia's Forest Professionals is tasked with regulating the profession as a whole in British Columbia and ensuring the competency and professionalism of its members. Forest professionals hold paramount their duty to serve and protect the public interest.

It was identified that under the Forest Practices Code of British Columbia, little freedom to manage was granted to these forest professionals. The Code was very prescriptive in nature and although it offered an extremely high level of protection to a number of forest values, it often led to inefficiencies in every day operations of both industry and government. Industry and government representatives set out to radically transform the forest industry to help the forest industry remain globally competitive, while still protecting the environmental values assigned by society. The outcome was the results-based Forest and Range Practices Act. This new legislative framework allows for a much greater utilization of organizational resources in forest management, but puts many forest management considerations into the non-statutory realm. The foundation of this new policy architecture is professional reliance.

Professional reliance rests on the belief that forest professionals are called upon to apply their judgment and make decisions for which they are accountable to the public through the Association British Columbia's Forest Professionals. Respectful challenges to a forest professional's decisions are accepted and can be addressed with a sound rationale. When bringing the Forest and Range Practices Act into power, a subsequent move was taken to strengthen the Association's power to hold its members accountable through the Forester's Act.

This Strategy has been built with the need to allow forest professionals to make the best management decision at the stand level. Therefore, exact enhanced retention targets have not been set; however, appropriate professional care dictates that a forest professional undertakes a comprehensive analysis when determining the best management decision for the values assigned by society. This Strategy is built on the premise that individuals that represent the public interest, industry and government become familiar with their new

roles and responsibilities in forest management. Further information on the role of forest professionals and the complaint process for professional's conduct can be found at the following website: <http://www.abcfp.ca/>.

Annual Review Schedule and Monitoring

The 100 Mile House Enhanced Retention Strategy will be reviewed annually at a meeting established by the Ministry of Forests and Range for the duration of expedited harvest of MPB killed timber. The first review will be scheduled sometime after May 31st, 2009. At this time it will be considered whether additional information should be included into the mapping products. If it is justified that updates to the mapping products are necessary, the decision will be based upon available resources.

The annual review will provide the opportunity for resource professionals to provide feedback on how implementation of this Strategy is affecting the industry and the environment. Although the review is an opportunity to justify non-adherence to the Strategy, this review is primarily intended to strengthen the Strategy by making it more effective at protecting non-timber resource values and mid-term timber supply. Those professionals who implement this Strategy will be given the opportunity to identify what is working well and identify those areas that need clarification.

There were a number of components to the Chief Forester decision to raise the AAC for the 100 Mile House TSA that are outlined in this determination (Snetsinger 2006). This Strategy touched on two of these components: the harvest of timber types greater than 70% pine and enhanced retention to protect resource values impacted by accelerated MPB harvest. The Chief Forester has asked that the MoFR staff report on how efforts to implement these components are proceeding.

Although this Strategy is built on the premise that forest license holders will focus their harvesting activities to timber types that are greater than 70% pine, the intent of the Strategy is to provide guidance on enhanced retention. The implementation of enhanced retention can serve a multitude of purposes. Therefore, the success or monitoring of this Strategy will not be measured by determining how closely the harvest levels of timber types matched the greater than 70% pine direction. Rather, the MoFR staff will evaluate on a watershed or TSA basis whether enhanced (greater than legislative requirements) retention is being implemented and to what degree. The MoFR is currently developing a formalized process for monitoring and reporting to the Chief Forester the specific components of his determination and will be included as an addendum to this document once complete.

Retention Mapping for Non-Timber Objectives

All analysis and map creation for this project was done by Carol Bjorkman, Spatial Information Analyst, ILMB, Williams Lake. The project was divided into 2 distinct deliverables: a set of Values maps and a set of Projection maps. Both cover the entire 100 Mile House TSA.

Datasets used on Values Maps

The final Values maps were printed at a scale of 1:15,000, using the BCGS 1:20K mapsheet grid as an index. The following datasets were included on the maps:

From the Land & Resource Data Warehouse (LRDW) – IDWPROD1:

- WHSE_ADMIN_BOUNDARIES.FADM_DISTRICT
- WHSE_BASEMAPPING.BCGS_20K_GRID
- WHSE_BASEMAPPING.TRIM_CONTOUR_ANNO
- WHSE_BASEMAPPING.TRIM_CONTOUR_LINES
- WHSE_BASEMAPPING.TRIM_EBM_WATERBODIES
- WHSE_BASEMAPPING.TRIM_EBM_WATERCOURSES
- WHSE_BASEMAPPING.TRIM_TEXT_ANNO
- WHSE_BASEMAPPING.TRIM_TRANSPORTATION_LINES
- WHSE_BASEMAPPING.TWA_LINEAR_WATER
- WHSE_CADASTRE.CBM_CADASTRAL_FABRIC_PUB_SVW
- WHSE_FOREST_TENURE.FTEN_CUT_BLOCK_POLYGONS
- WHSE_FOREST_TENURE.FTEN_ROAD_LINES
- WHSE_FOREST_VEGETATION.RSLT_OPENING_POLY_SVW
- WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY
- WHSE_FOREST_VEGETATION.VEG_LABEL
- WHSE_PARKS.PA_PROTECTED_AREA_POLY
- WHSE_TANTALIS.TA_INTEREST_PARCEL_SHAPES
- WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP
- WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE_HABITAT_AREA_POLY

From the Local Publication SDE – SRMPROD1:

- REG_HUMAN_CULTURAL_ECONOMIC.REC_VIEWSHEDS_CAR_POINT
- REG_HUMAN_CULTURAL_ECONOMIC.REC_VIEWSHEDS_CAR_POLY
- REG_LAND_AND_NATURAL_RESOURCE.FISH_CRITICAL_HAB_CAR_POLY
- REG_LAND_AND_NATURAL_RESOURCE.GOAL2_AREAS_CAR_POLY
- REG_LAND_AND_NATURAL_RESOURCE.HIGH_VALUE_WETLANDS_CAR_POLY
- REG_LAND_AND_NATURAL_RESOURCE.LAKE_MANAGEMENT_ZONES_CAR_POLY
- REG_LAND_AND_NATURAL_RESOURCE.NON_PRODUCTIVE_FOREST_CAR_POLY
- REG_LAND_AND_NATURAL_RESOURCE.OLD_GROWTH_MGMT_CAR_POLY
- REG_LAND_AND_NATURAL_RESOURCE.STREAM_MANAGEMENT_CAR_POLY

- REG_LAND_AND_NATURAL_RESOURCE.VISUAL_QUALITY_OBJ_CAR_POLY
- REG_LAND_AND_NATURAL_RESOURCE.WETLAND_MGMT_CAR_POLY

From Other Sources:

- Wildlife Features -
//marble/work/FOR/RSI/DMH/Local_Data/Wlap/WildlifeFeatures.csv
- Interior Forest Patches - Data obtained from project wl_07_0107_patch_analysis done by Mark McGirr.
- Badger Viewing and/or Burrows – Data obtained from Roger Packham
- Some Wildlife Tree Patch data is presented; however, as not all information was received before production the data in this layer should be viewed cautiously. It is recommended that individual professionals become familiar with Wildlife Tree Patches managed under other tenure holders Cutting Permits.
- Wildlife Habitat Areas (proposed) - //wml/arclib/wld/whas/tpwha_rca/polygon

Summary of Analysis to Produce Projection Mapping Dataset and Maps

Final Dataset:

//slkgis2/work/srm/nr/arcproj/wl/wl_07_0152/fin/retention_ranking.gdb/retention_ranking

Note: The “scores” referred to in the table and steps below were calculated based on the indicators, categories, and ranking table in Appendix A.

Table 1. Fields in retention_ranking dataset:

Field Name	Alias	Definition
A_RNK	Anchor Rank	Score given based on proximity to existing anchor or retention
PIN_RNK	Pine Rank	Score given based on percentage of pine in stand
DEC_RNK	Deciduous Rank	Score given based on percentage of deciduous species in stand
AGE_RNK	Age Rank	Score given based on age class of stand
SIZE_RNK	Stand Size Rank	Score given based on size of stand (VRI polygon size)
WAT_RNK	Watershed Sensitivity Rank	Score given based on watershed sensitivity
RMZ_RNK	Riparian Proximity Rank	Score given based on proximity to riparian reserve or management zones
FEN_RNK	Forest Ecosystem Network Rank	Score given based on whether or not polygon is in FEN
RET_RNK	Retention Rank	Sum of all other fields (symbolize on this field)

For this analysis, processing was broken down into several steps. The majority of processing was done using Python scripts, with some components done in ESRI’s Model Builder.

1. Buffered existing retention areas³ (legislated non-harvest retention & legislated constrained retention) and assigned a value based on buffer distance (A_RNK).
2. Extracted VRI data for the 100 Mile House Forest District (DMH) and calculated scores for PIN_RNK, DEC_RNK, AGE_RNK and SIZE_RNK.

³ See Appendix B - Datasets buffered as existing anchor or retention areas

3. Extracted Watershed Sensitivity data for DMH and calculated scores for WAT_RNK. Watershed Sensitivity data was obtained from project w1_06_0001_hydro_rank, done for Muhammed Sabur, MOE, by Mark McGirr. (\\slkgis2\work\srm\nr\arcproj\w1\w1_06_0001_hydro_rank\ver2\fin\gdb_watershed_ranking.mdb\combined_watersheds_and_rankings)
4. Extracted riparian management zones and riparian reserve zones from lake, stream, and wetland management datasets and calculated scores for RMZ_RNK.

Table 2. Riparian datasets used to determine RMZ_RNK field.

Source	Common Name	Dataset Name	Definition Query
SRMPROD1	Lake Management	REG_LAND_AND_NATURAL_RESOURCE.LAKE_MANAGEMENT_ZONES_CAR_POLY	[LK_BUFFER] LIKE '%RRZ' OR [LK_BUFFER] LIKE '%RMZ'
SRMPROD1	Stream Management	REG_LAND_AND_NATURAL_RESOURCE.STREAM_MANAGEMENT_CAR_POLY	[STREAM_BUFFER] LIKE '%m%' or [STREAM_BUFFER] LIKE '%r%'
SRMPROD1	Wetland Management	REG_LAND_AND_NATURAL_RESOURCE.WETLAND_MGMT_CAR_POLY	[WET_BUF] LIKE '%r%' OR [WET_BUF] LIKE '%m%'

5. Calculated score for FEN_RNK.
6. Combined all of the above datasets into a single dataset using a union analysis and calculated RET_RNK field.

$$RET_RNK = A_RNK + PIN_RNK + DEC_RNK + AGE_RNK + SIZE_RNK + WAT_RNK + RMZ_RNK + FEN_RNK$$

The final Projection maps were printed at a scale of 1:15,000, using the BCGS 1:20K mapsheet grid as an index. Retention potential was ranked as follows:

Table 3. Retention Potential Ranking for Projection maps

Rank	[RET_RNK] value
Low	< 16
Medium	16 – 20
High	21 – 25
Very High	> 26

References

- Bunnell, F.L., K.A. Squires, and I. Houde. 2004. Evaluating the effects of large-scale salvage logging for mountain pine beetle on terrestrial and aquatic vertebrates. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, British Columbia. Mountain Pine Beetle Initiative Working Paper 2004-2. 57 p.
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- Forest Analysis and Inventory Branch. 2007. Timber Supply and the Mountain Pine Beetle Infestation in British Columbia: 2007 Update. Ministry of Forests and Range, Southern Interior Forest Region.
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- Integrated Land Management Bureau. 1995. Cariboo Chilcotin Land Use Plan: Ninety Day Implementation Process Final Report. (Any other related documents). Province of British Columbia. <http://ilmbwww.gov.bc.ca/lup/lrmp/northern/cclup/index.html>
- Klenner, Walt. 2005. Maintaining habitat structure and wildlife diversity during salvage harvesting on Mountain Pine Beetle attack areas in the Southern Interior Forest Region. Draft Version 1.0. Ministry of Forests, Southern Interior Forest Region, Kamloops, BC.
http://www.for.gov.bc.ca/hfd/Pubs/RSI/FSP/EN/RSI_EN04.htm
- Martin, Marnie. 2006. Retention measures to address ecological values in Mountain Pine Beetle affected forests in BC, A Discussion Paper with Recommendations. Version 1.0, Ministry of Environment. [http://www.for.gov.bc.ca/hfp/fft/fftreports/MPB%20-%20Salvage%20Retention%20final%20Feb%2016%20\(2\).doc](http://www.for.gov.bc.ca/hfp/fft/fftreports/MPB%20-%20Salvage%20Retention%20final%20Feb%2016%20(2).doc)
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- Snetsinger, Jim. 2006. 100 Mile House Timber Supply Area: Rationale for Allowable Annual Cut (AAC) Determination. Ministry of Forests and Range, British Columbia.
<http://www.for.gov.bc.ca/hts/tsa/tsa23/tsr3/23ts06ra.pdf#search=%22Chief%20%20Forester%20%20Rationale%20%20100%20%20Mile%20%20House%22>

Appendix A – Indicators, Categories, and Ranking used to Identify Options for Retention

Indicators, Categories, and Ranking used to Identify Options for Retention

Indicator	Category	Ranking	Field
1. Proximity to existing anchor or retention area *	a. 0m - 100m	4	A_RNK
	b. >100m - 200m	3	
	c. >200m - 400m	2	
	d. >400 m	1	
2a. Species Composition - Coniferous	a. ≤ 30% pine	8	PIN_RNK
	b. >30% - 50% pine	6	
	c. >50% - 70% pine	2	
	d. >70% pine	1	
2b. Species Composition - Deciduous	a. >70% deciduous	4	DEC_RNK
	b. >50% - 70% deciduous	3	
	c. >30% - 50% deciduous	2	
	d. ≤ 30% deciduous	1	
3. Age Class	a. 4 and 5 (61-100 years)	3	AGE_RNK
	b. 6 (101-120 years)	2	
	c. 7 (121-140 years)	1	
	d. 8+ (>140 years)	4	
4. Polygon Size (Stand Size)	a. 20 ha - 30 ha	3	SIZE_RNK
	b. >30 ha - 60 ha	2	
	c. >60 ha - 100 ha	1	
	d. >100 ha	4	
5. Watershed Sensitivity	a. 11 and 12	1	WAT_RNK
	b. 13 and 14	2	
	c. 15 and 16	3	
	d. 17 and 18	4	
	e. 19 and 20	5	
6. Riparian Reserve or Management Zone**	SMZ, SRZ, RMZ, RRZ, LMZ, LRZ	30	RMZ_RNK
7. Forest Ecosystem Network (FEN)	a. In FEN	2	FEN_RNK
	b. Not in FEN	0	

*Existing anchor or retention areas include:

- Permanent OGMA's
- Riparian Reserve & Management Zones from Wetland, Stream, and Lake Management datasets
- Caribou non-harvest & modified harvest areas
- Parks & Protected Areas (including Goal 2 Areas)
- Visual Quality Objectives - Full, Partial, & Modified Retention
- Wildlife Habitat Areas - proposed & legislated
- Ungulate Winter Range
- Natural Range Barriers - Scenic Areas

**Includes riparian reserve and management zones from the lake, wetland, and stream management datasets. From the stream management dataset, only stream classes 1-4 were included.

Appendix B – Datasets Buffered as Existing Anchors or Retention Areas

Source	Common Name	Dataset Name	Definition Query
LRDW	Parks & Protected Areas	WHSE_PARKS.PA_PROTECTED_AREA_POLY	
LRDW	Wildlife Habitat Areas	WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE_HABITAT_AREA_POLY	
WML ArcLib	WHA - Proposed	//wml/arclib/wld/whas/tpwha_rca/polygon	[SPECIES] <> "
LRDW	Ungulate Winter Range	WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP	
SRMPROD1	Goal 2 Areas	REG_LAND_AND_NATURAL_RESOURCE.GOAL2_AREAS_CAR_POLY	
SRMPROD1	OGMA's	REG_LAND_AND_NATURAL_RESOURCE.OLD_GRWTH_MGMT_CAR_POLY	[OGMA_TYPE] = 'PERM'
SRMPROD1	Lake Management	REG_LAND_AND_NATURAL_RESOURCE.LAKE_MANAGEMENT_ZONES_CAR_POLY	[LK_BUFFER] LIKE '%RRZ' OR [LK_BUFFER] LIKE '%RMZ'
SRMPROD1	Stream Management	REG_LAND_AND_NATURAL_RESOURCE.STREAM_MANAGEMENT_CAR_POLY	[STREAM_BUFFER] LIKE '%m%' or [STREAM_BUFFER] LIKE '%r%'
SRMPROD1	Wetland Management	REG_LAND_AND_NATURAL_RESOURCE.WETLAND_MGMT_CAR_POLY	[WET_BUF] LIKE '%r%' OR [WET_BUF] LIKE '%m%'
SRMPROD1	Caribou Strategy	REG_LAND_AND_NATURAL_RESOURCE.CARIBOU_STRATEGY_CAR_POLY	[CARI_MOE] = 'no_ha' or [CARI_MOE] = 'mod_ha'
SRMPROD1	Visual Objectives	REG_LAND_AND_NATURAL_RESOURCE.VISUAL_QUALITY_OBJ_CAR_POLY	[VISUALS] = 'M' OR [VISUALS] = 'PR' OR [VISUALS] = 'P' OR [VISUALS] = 'R'
SRMPROD1	Scenic Areas	REG_LAND_AND_NATURAL_RESOURCE.VISUAL_QUALITY_OBJ_CAR_POLY	[VISUAL_SOURCE] = 'V_COR'
SRMPROD1	Key Wetlands for Moose	REG_LAND_AND_NATURAL_RESOURCE.HIGH_VALUE_WETLANDS_CAR_POLY	
Other	Natural Range Barriers	Obtained from Selena Ross, GIS Technician, MoFR Range Branch (PG) – dataset currently sitting in project working directory //slkgis2/work/srm/nr/arcproj/wl/wl_07_0152_retention/src/dmh_range_barriers/dmh_arc.shp	[FEATURE] = 'ROCK' OR [FEATURE] = 'SLOPE' OR [FEATURE] = 'WATER'