Southern Rocky Mountains Management Plan
Base Case
Environmental Assessment

Flathead River Valley

Prepared for
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Executive Summary

This report provides a summary of current management practices and existing conditions for select environmental values of concern in the Southern Rocky Mountains Management Plan (SRMMP) area. Using a multiple accounts assessment framework, this document attempts to describe the implications of current management practices in the absence of the Southern Rocky Mountains Management Plan (i.e., Base Case management regime). As such the document focuses on the management direction outlined in the *Kootenay Boundary Land Use Plan Implementation Strategy* (1997) as well as the *Higher Level Plan Order* (January 2001)[1].

The purpose of the Base Case is to provide a "benchmark" to which the SRMMP can be compared. However, it should be emphasized that this report is limited in scope and does not include some of the most recent mapping initiatives (e.g., ungulate winter range, grizzly bear) nor any spatial or temporal modelling. A more detailed ecological inventory (i.e., PEM/TEM, site series, stand structure) should be used during future monitoring and/or conservation risk assessments as it becomes available. This information will be required to adequately monitor ecological trends related to variation in natural disturbance regimes as well as natural variation in stand structure, composition and function. Although there are emerging methods and decision-making tools that would have been useful to include in this Base Case analysis (e.g., DART, timber/habitat supply models) time and resources precluded their use.

Despite these shortcomings, a largely qualitative evaluation of current management practices was able to identify strengths and weaknesses related to current management practices in the SRMMP area. The potential implications and relative risks of continuing with the current management regime to select environmental accounts are summarized below:

Environmental Account	Implications of Base Case Management
Old Growth	• There are relatively few mature or old forest stands currently present in the MSdk and ICHmk1, with slightly greater amounts of mature and old forest present in the ESSFdk non-contributing areas. • Although this report could not address the relative abundance of mature and old forest over time, the previous analysis of the KBLUP-IS (1996) did provide an estimation of risk based on assigned BEOs and the deviation of seral stage distribution from natural levels over discrete time periods (0,20,70 and 250 years). Reviewing the landscape units that are contained in the SRMMP area indicated that over the short-term (next 20 years), valley bottoms habitats, particularly those that occur in the West Flathead, Wigwam, Lower Elk, West Elk, Upper Elk and Fording River Landscape Units are at high risk to very high risk. Over the mid to long term, risks decline to moderate-low levels in the Flathead and Wigwam but remain high throughout the Elk valley. • Overall, some mature and old forests will remain on the THLB to meet the Kootenay Boundary HLPO, VQO objectives as well as other FPC requirements (e.g., *Riparian Reserve Zones*, *OGMAs, Wildlife Tree Patches*), however, there will be fewer large areas of mature and old forest present in valley bottom forests. • Old growth management areas (OGMAs) need to be spatially identified that provide adequate ecosystem representation at the variant level, but

1 Although the most recent HLP amendment (October 2002) should be considered as Base Case management, this report has assumed the 2001 HLP order to be consistent with the Socio-Economic Multiple Accounts Assessment, which was completed before the October 2002 amendment.

	preferable at the site series level to ensure rare ecosystems are captured.
Connectivity Corridors	• The Kootenay-Boundary HLP Order states that connectivity corridor objectives will be addressed using the mature and old forest seral targets available within each BEO/NDT combination. Whether there is adequate mature and old forest to meet the connectivity corridor objectives is not clear at this time. Overall, the matrix of crown and private lands in the SRMMP area poses significant challenges to maintaining regional connectivity. As such the risks to species dependent on connectivity corridors remains high in the Elk Valley with somewhat lower risks (moderate) in the remaining plan area.
Ungulate Winter Range	• As part of the *Forest Practices Code* (OPR), establishment of *Ungulate Winter Ranges* (UWR) suggests low to moderate risks to ungulate populations. However, refining access as well as recreation management strategies would further reduce the risks to ungulate populations over the long term. • Most ungulate populations are believed to be stable to increasing including white-tailed deer, mule deer, elk, moose, and mountain goat. Bighorn sheep herds are stable in the Elk Valley and Lizard (Elko) but slightly declining in the Wigman valley.
Grizzly Bear	• The KBLUP *Implementation Strategy* outlined grizzly bear management guidelines that addressed maintenance of critical feeding areas as well as access management. In addition, the Higher Level Plan Order includes provisions to maintain mature and/or old forest adjacent to avalanche chutes important to grizzly bears. The amount of mature and old forest available, however, is dependent on how much remains after complying with other HLPO objectives (e.g., OGMAs, caribou). As such, the extent to which this objective can be applied across the plan area is unclear at this time. Although the overall intent of the objective is viewed as a positive measure to reduce disturbance to grizzly bear feeding and security areas, implementation of this objective has been contingent on the completion of avalanche chute mapping, which has only recently been completed. Hence, this objective has the potential to maintain habitat effectiveness in the future; however, until the objective is fully implemented operable portions of grizzly bear habitats remain vulnerable to forest harvesting activities. • Overall, the relative risks to grizzly bears will vary throughout the plan area. Risks will remain high on private land as well as areas where seral stage distribution may be incompatible over the long term such as Low BEOs. However, over the majority of SRMMP area, risks are moderate assuming the HLPO and KBLUP-IS is fully implemented. In particular, the long term population viability of grizzly bear is contingent upon implementation of effective access as well as recreation management strategies. Without these, grizzly bears will remain at high risk where high levels of human activity and bear habitats overlap.
Fish Habitat	• The potential for future road development to negatively impact fish habitat will increase over time. However, recommendations outlined in the FPC *Riparian Management Area Guidebook* partly reduce the risk to fisheries values. Overall, the risk to fish habitat is moderate, however, risks are higher for smaller streams (S4, S5, S6) due to a lack of adequate protection. In addition, a lack of a complete inventory for bull trout (a blue-listed species) suggests bull trout populations remain at risk.

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1.0 Introduction

This Base Case report summarizes the expected changes and relative risks to the environment (biodiversity, wildlife, and fish) that would result if status quo management were to continue in the Southern Rocky Mountain Management Plan (SRMMP) area. The purpose of the Base Case is to provide a "benchmark" by which the recommended SRMMP can be compared. The Base Case assumes a continuance of current management practices and attempts to address qualitatively the trends for each environmental value in the absence of the SRMMP. Although current management practices have been guided by the regional land use plan and the *Kootenay-Boundary Land Use Plan - Implementation Strategy* (1997), only certain provisions of the KBLUP have been established as higher-level plan objectives. Therefore, only those higher level plan objectives as set out in the *Kootenay-Boundary Higher Level Plan Order* (2000) are considered current management as well as all *Forest Practices Code* (FPC) regulations (e.g., Riparian Reserve Zones). Although emerging direction from the new results-based *Forest Practices Code* (FPC) should also be considered as part of the Base Case management regime, specific details regarding the regulations and standards remain unknown at this time. Current management practices related to the mining sector include legislation and regulations outlined in the *Mines Act*, *Mineral Exploration* (MX) *Code*, *Mining Rights Amendment Act* and the *Environmental Assessment Act*.

1.1 Background

Although the Southern Rocky Mountain Management Plan Area was originally identified as a potential *Wildlife Management Area* (WMA) under the B.C. *Wildlife Act*, the current government determined that additional resource management direction was required to adequately balance social, economic and environmental values. As such the purpose of the Southern Rocky Mountains Management Plan (SRMMP) is to refine and coordinate the implementation of the KBLUP strategies on an area-specific basis and to provide recommendations for Landscape Unit (LU) or lower level planning.

The Southern Rocky Mountain Management Plan (SRRMP) covers the southeast portion of the East Kootenays and extends from the B.C./Montana border north through the Flathead and Wigwam watersheds and portions of the Elk and Bull River watersheds to the southern boundary of Heights of the Rockies Provincial Park (an estimated 450,000 ha). For resource evaluation purposes, however, the area has been broadened from the previous Conservation Area boundary in order to undertake a scientifically based process, which works on the premise of ecosystem management. The resource evaluation area covers approximately one half of the Cranbrook Forest District (754,797 ha) and encompasses 18 complete landscape units (Table 1)

Table 1. Landscape Units in the Southern Rocky Mountain Management Plan Area * and their assigned Biodiversity Emphasis Option (BEO)

Landscape Unit	Biodiversity Emphasis
Upper Elk	Intermediate
Lower Elk	High
West Elk	High/Intermediate
East Elk	Low
Fording River	Intermediate
Alexander Line	Intermediate
Upper Bull	Intermediate
Galbraith-Dibble	Intermediate
Iron Sulphur	Intermediate

Corbin Creek	Low
Sand Creek	Intermediate
Jaffray-Baynes Lake	Low
Galton	Low
Lodgepole-Bighorn	High/Intermediate
Wigwam River	High
Upper Flathead	Intermediate
West Flathead	Intermediate
East Flathead	Intermediate

* as established in KBLUP HLP Order

2.0 Methods

The methods used to assess potential impacts of land use management are consistent with the approaches outlined in two documents including: (i) *Environmental Risk Assessment (ERA): an approach for assessing and reporting environmental conditions* (MELP 2000): (ii) draft *Provincial Multiple Accounts Assessment Guidelines* (2001).

It should be emphasized that the Multiple Accounts Assessment (MAA) definition of the Base Case differs somewhat from how the Base Case is defined by the *Environmental Risk Assessment* (ERA) approach adopted by the Ministry of Environment Lands and Parks (see below). In essence, the MAA definition of the Base Case includes both the implications of current management practices today as well as forecasting those potential impacts into the future. The ERA approach defines the Base Case as the 'natural' or undisturbed condition to which all other management regimes should be compared. Although the MAA appears to compare alternative land use scenarios only to existing management practices, the MAA Base Case implicitly considers the historic conditions and past development impacts when evaluating current conditions.

2.1 Defining Current Management

There are a variety of existing management practices and policies that direct resource development activities (e.g., forestry, mining) and environmental protection in B.C. These management practices need to be evaluated when determining the implications of Base Case management specific to the Cranbrook Forest District. Because implementation of certain policy initiatives can be uncertain (e.g., Results-Based Forest Practices Code) or dependent on implementation of the SRMMP many current management practices are difficult to quantify. Some of the key management practices and procedures considered as Base Case management include:

- KBLUP Higher Level Plan Order (January 2001)
- Timber Supply Review II (1999)
- Forest Practices Code
- Identified Wildlife Management Strategy
- Expanded Kootenay Region Interim Wildlife Guidelines for Commercial Recreation in British Columbia
- Mineral Exploration Code

2.2 The Kootenay Boundary Higher Level Plan Order

In addition to other existing legislation and policies, the Base Case management regime includes provisions identified in the Kootenay Boundary HLP Order (January 2001). However, it should be emphasized that only certain management objectives and strategies identified in the KBLUP were established as a Higher Level Plan. Although the most recent amendment should be considered as Base Case management, this assessment has assumed the January 2001amendment as current practice to ensure consistency with the Socio-Economic Multiple Accounts Base Case report.

Lastly, it should be emphasized that a Forest Practices Code higher level plan only addresses forest operations and does not affect all of the area or development activities other than forestry within the SRMMP area. Specifically, the HLP states:

Pursuant to Section 3(1) of the FPC Act, the Cranbrook Resource Management Zone was established. Specific objectives and strategies established as a HLP include:

(1) Adopt Biodiversity Emphasis Options (BEOs) as per Table 1 (this document).

(2) Retain mature and old forest retention targets (as per LUPG)

(3) In specific areas only, establish green-up height as 2.5 m in areas adequately restocked and 3.0 m in areas insufficiently stocked. In addition, patch size will be increased.

(4) Retain adequate amounts of mature and/or old forests adjacent to important avalanche tracks to maintain grizzly bear habitat.

(5) To reduce the impacts of forest development on consumptive use streams (human), in areas outside the Enhanced Resource Development Zone – Timber, apply a 30 m Riparian Management Zone to S5 and S6 streams.

(6) Establish specific areas as Enhanced Resource Development Zones – Timber

(7) Using existing targets, maintain mature and/or old forests within identified regional connectivity corridors.

(8) Restore and maintain the ecological integrity of fire-maintained ecosystems

(9) Establish high quality viewscapes as known scenic areas

2.3 Key Environmental Accounts

To compare the Base Case with the SRMMP each environmental account (value) requires a measurable criteria to be used as an **indicator**[2] to assist decision-makers determine if objectives for valued environmental components are likely to be achieved. Environmental accounts and indicators for this assessment reflect regional conservation assessment priorities identified in the KBLUP-IS (1997) as well as the availability of mapped information.

Specific environmental accounts considered in this document include both landscape level coarse filter biodiversity indicators as well as fine filter indicators including:

- Regional Connectivity Corridors - coarse filter
- Seral Stage Distribution (Old Growth) - coarse filter
- Ungulate Winter Range - fine filter
- Grizzly Bear - fine filter

It should be noted that these "indicators" are chosen largely because they reflect the availability of mapped information, which is required to conduct the Multiple Accounts Assessment. However, other key elements of biodiversity are discussed qualitatively in this report including wildlife tree retention, riparian ecosystems, furbearers and fish habitat. It should be emphasized that indicators assessed in this report do not necessarily reflect all of the potential **monitoring indicators** that may be used during biological effectiveness monitoring initiatives (e.g., tracking rare forest type representation, patch size, interior forest conditions).

The MSRM (Victoria/Cranbrook) provided the most recent inventory information for the environmental indicators/accounts used in this report. A composite ungulate winter range map was provided that represented four ungulate species including elk, moose, bighorn sheep and mule deer. No mountain goat winter range information was available for this assessment. In addition, grizzly bear habitat mapping represented the grizzly bear 'priority areas' as identified in the KBLUP. It is our understanding that more detailed habitat mapping (ungulate winter range, grizzly bear) is being used during the SRMMP planning process and will be available for future assessments.

Using a Geographic Information System (GIS), the total amount (hectares) of each mapped environmental account (e.g., ungulate winter range) present in the SRMMP area was identified. These static area summaries were further broken down into four categories including areas potentially available for forest harvesting (THLB), forested areas excluded from logging activities (i.e., "forested exclusions- FE"), non-forested exclusions (NFE), and private land.

2.4 Assumptions

In order to estimate potential impacts to environmental values a number of key *assumptions* were required (Table 2). In addition, assumptions that are more species-specific (fine filter) were necessary and are defined for both ungulate winter range and grizzly bear accounts. These

2 It is important to differentiate between indicators necessary to conduct the area analysis (i.e., *mapped* or spatial representations of resource values - **assessment indicators**) and those that are *not mapped* but still are critical to maintain environmental quality (e.g., sedimentation rates, concentration of water contaminants (ppm) - **monitoring indicators)**. Although this analysis primarily used assessment indicators, other monitoring indicators were also considered if they were explicitly part of current management objectives and strategies.

assumptions were derived primarily from the published literature (see references), local knowledge and professional judgement.

Table 2. Key assumptions used to estimate potential land use impacts on environmental values.

- *The more closely managed forests resemble natural disturbance regimes[3] (i.e., maintain forest composition and stand structures), the greater the probability that populations of all native species will be maintained.*
- *Consistent with the Biodiversity Guidebook (1995), risks to biodiversity increases along a continuum with increasing intensity levels of resource development. That is, lower intensity development areas provide more options and opportunities for maintaining native species and ecological processes.*
- *Wildlife habitats that occur on private land or the Timber Harvesting Land Base (THLB) are at higher risk than habitats that occur on excluded crown land areas (i.e., inoperable areas) due to loss of unique valley bottom habitats, significantly altered seral stage distributions, road access and increased human disturbance. Although forested areas that occur outside of the THLB contribute to biodiversity, they do not necessarily provide equivalent habitat quality compared to areas that occur within the THLB. Establishment of Old Growth Management Areas (OGMAs), Wildlife Habitat Areas (WHAs) and Wildlife Tree Retention (WTR) on the THLB, however, are assumed to partly reduce the risks for some species.*
- *Overall, landscapes dominated by younger seral forests, simplified stands (reduced forest structure), and smaller patches (i.e., reduced forest interior conditions and increased fragmentation) pose high risks to biodiversity. Similarly, landscapes dominated by young seral grassland communities, pose higher risks to biodiversity than landscapes dominated by climax potential natural communities (grasslands) due to reduced plant and animal species diversity.*
- *More open roads result in increased risks to specific species. In particular, increased road development results in greater mortality risks for large mammals (e.g., grizzly bears and ungulates) and potential habitat loss and fragmentation for smaller species (e.g., amphibians, small mammals). Access management strategies (e.g., access control points etc.), however, are assumed to partly mitigate potential long-term adverse effects of increased road access from forest, mineral or other development.*

Data Limitations

It should be recognized that although our ability to accurately predict the consequences of land use changes on wildlife populations is improving, few ecological studies have been conducted at spatial and temporal scales appropriate for sub-regional conservation assessments (i.e., hundreds of thousands of ha over long time periods). The effect of land use practices on other organisms (e.g. invertebrates, soil biota) is even more uncertain. Overall, there has been relatively few studies that have used empirical data to address the functional relationships between habitat supply, habitat structure and population density, which further limits our predictions of land use change. Ideally, habitat supply models and/or spatially explicit population models (derived from empirical data) would be developed to permit forecasting of temporal and spatial habitat availability under alternative land use scenarios. These alternative land use scenarios could then be ranked according to their relative risk to population viability. The data necessary to use these decision tools, however, were not available for this assessment.

1 "natural" disturbance regime refers to disturbance events pre-European contact.

Despite these limitations, a science-based assessment of the implications of strategic land use practices on wildlife is still possible using a combination of qualitative and quantitative approaches. The relatively high level of knowledge about the habitat requirements and mortality risks of the wildlife species considered here (i.e. grizzly bear, deer, elk, moose,) provides a relatively sound and reliable basis for this assessment, which is intended primarily to identify strengths and weaknesses in current management practices with a view to improving the outlook for environmental values under management direction of the SRMMP.

2.5 Risk Assessment

A relative *risk assessment* approach was used to assess the potential impacts of current management practices on each environmental value using quantitative GIS area summaries in combination with the assumptions outlined in Table 1 as well as the species-specific ones.

Risk is defined as the probability or likelihood of an adverse event occurring over the short or long term. For the purposes of this assessment, an adverse event or outcome includes such things as a decrease in fish or wildlife habitat quantity or quality, increased mortality, altered predator-prey relationships or population decline – adapted from Bergman et al 1993.

Potential causal factors that may result in one or more of these adverse outcomes include timber harvesting, mining, road development and/or increased human disturbance. In general, risks were assumed to be positively correlated with increasing levels of land use intensity to reflect altered future landscape conditions. This approach is consistent with the risks to biodiversity outlined in the *Biodiversity Guidebook* (1995).

Although a baseline benchmark is ideally used to assess risk to biodiversity, (e.g., range of natural variability) these data are not readily available for all effectiveness monitoring indicators. Instead, we have used the Biodiversity Emphasis Option as a static indicator of deviation from natural disturbance patterns. For other values a "low risk benchmark" is used to define the conditions necessary for a particular element of biodiversity to sustain itself. This typically included best management practices that adequately meet the habitat requirements for a particular species and/or comparing attributes found in unmanaged areas to those that occur in managed stands.

Five relative risk levels (Very High, High, Moderate, Low, Very Low) were used and attempted to incorporate the significance of a potential impact by addressing both the likelihood and magnitude of the effect (i.e., management practices) on each environmental value. Where possible, the assessment attempts to determine the significance of impacts and estimated risks by using quantifiable objective information (e.g., GIS area statistics) as well as the available scientific literature, published reports and professional judgment. To determine an initial risk level, how much habitat that occurs on private land and well as the current timber harvesting land base (THLB) was considered. This provided an initial indication of the relative proportion of habitat potentially at risk. However, because some species depend on seasonal habitats that may be concentrated on the timber harvesting land base (e.g., grizzly bears), the THLB can be disproportionately important. As such, a small amount of overlap between habitat and THLB does not necessarily translate into small or low risk. It should also be emphasized that because mineral exploration/development as well road access can affect wildlife habitat that occurs outside the THLB, the gross land area statistics are also useful for determining potential impacts.

The next step included an evaluation of the current management practices in areas where the environmental values occur. The primary consideration or question asked here was "Are the current and/or imminent management practices compatible with maintaining a suitable distribution of habitats across the plan area necessary to maintain viable fish and wildlife populations?" The BEO was used to assess the target seral stage distribution and amount of old growth retained. Although the BEO provides an indication of deviance from natural levels, the amount of non-contributing forest often complicates the interpretation of each assigned emphasis.

To help clarify what the various risk levels mean in terms of implications for ecosystems and wildlife populations, a brief explanation is provided below for each risk level category.[4] It should be noted, that these habitat risk levels were developed and used to assess the environmental implications of the Kootenay Boundary Land Use Plan using the assumptions underlying the principle of natural seral stage distributions outlined in the *Biodiversity Guidebook* (1995). In general, the key assumption maintains that the more deviation from natural seral stage distributions the greater the risk of population decline and extirpation.

- ***Very low risk***: most populations likely to remain stable, or possibly increase where habitat restoration is successful; likely to be multiple areas of each habitat type which will allow habitats to withstand changes due to all but the most catastrophic natural stand-replacing events (e.g. unusually extensive forest fires); where local extirpations occur, connectivity (continuity of habitats) will likely allow for re-establishment of replacement populations.

- ***Low risk***: some populations likely to remain stable, or possibly increase where habitat restoration is successful; some populations dependent on habitats in short supply may decline; likely to be multiple areas of each habitat types which will allow habitats to withstand changes due to most natural stand- replacing events; where local extirpations occur, connectivity may allow for re-establishment of replacement populations.

- ***Moderate risk***: likely to result in reductions in some local populations with others remaining stable; local extirpations are possible where populations are left vulnerable to predators or other increased stress; may be sufficient redundancy in habitats to withstand changes due to most natural stand-replacing events; where extensive areas of young forest are present, these will create imbalances in habitat over time (e.g. 'boom and bust' feeding areas for grizzly bears); re-establishment of locally extirpated populations may be limited by lack of connectivity.

- ***High risk***: likely to result in significant declines in some populations with some local extirpations due to the lack of mature and old forests; The lack of redundancy in habitats will mean that any changes due to natural forest stand replacing events will likely result in further local extirpations; extensive areas of young forests will create imbalances in habitat over time; may contribute to semi-permanent and/or regional extirpations if risk level is long-lasting and/or covers a significant portion of a given population's range.

- ***Very high risk***: major reductions are likely in populations that are dependent on mature and/or old forest stands; many local extirpations; extensive areas of younger trees will create imbalances in habitat over time (e.g., 'boom and bust' feeding areas for grizzly bears); significant potential for contributing to permanent and/or regional extirpations or extinctions if risk level is long-lasting and/or the area at risk covers a significant portion of a given population's range.

Source: Kootenay Boundary Land Use Plan –Environmental Analysis

4 Adapted from: Environmental Risk Assessment (ERA): an approach for assessing and reporting environmental conditions. Ministry of Environment, Lands and Parks (2000) and Salasan, Kutenai Nature Investigations, Dovetail Consulting (1998).

Although this analysis did not explicitly model seral stage distributions, the deviation from natural levels were assumed to be correlated with resource development intensity as outlined in Table 3. It should also be recognized that these risk levels do not explicitly incorporate other risk factors such as increased road access. As mentioned above, management strategies (e.g., access) are used qualitatively to adjust risk ratings to account for other risk factors.

3.0 Overview of SRMMP Area

The plan area encompasses about 754,797 hectares from the B.C.-Montana border, north through the Flathead watershed and portions of the Wigwam, Elk, and Bull River watersheds to the southern boundary of Heights of the Rockies Provincial Park.

The SRMMP area is represented by 4 ecosections including the *Border Ranges* (BRR), *East Kootenay Trench* (EKT), *Crown of the Continent* (COC) and the *Southern Park Ranges* (SPK). Within these ecosections, there are a total of 14 biogeoclimatic subzone variants (Fig 1). The ESSFdk comprises the largest proportion of the plan area followed by the MSdk and together make up the majority of the timber harvesting land base (~81%). The distribution of land ownership indicates that a portion of most subzones also occurs on private land.

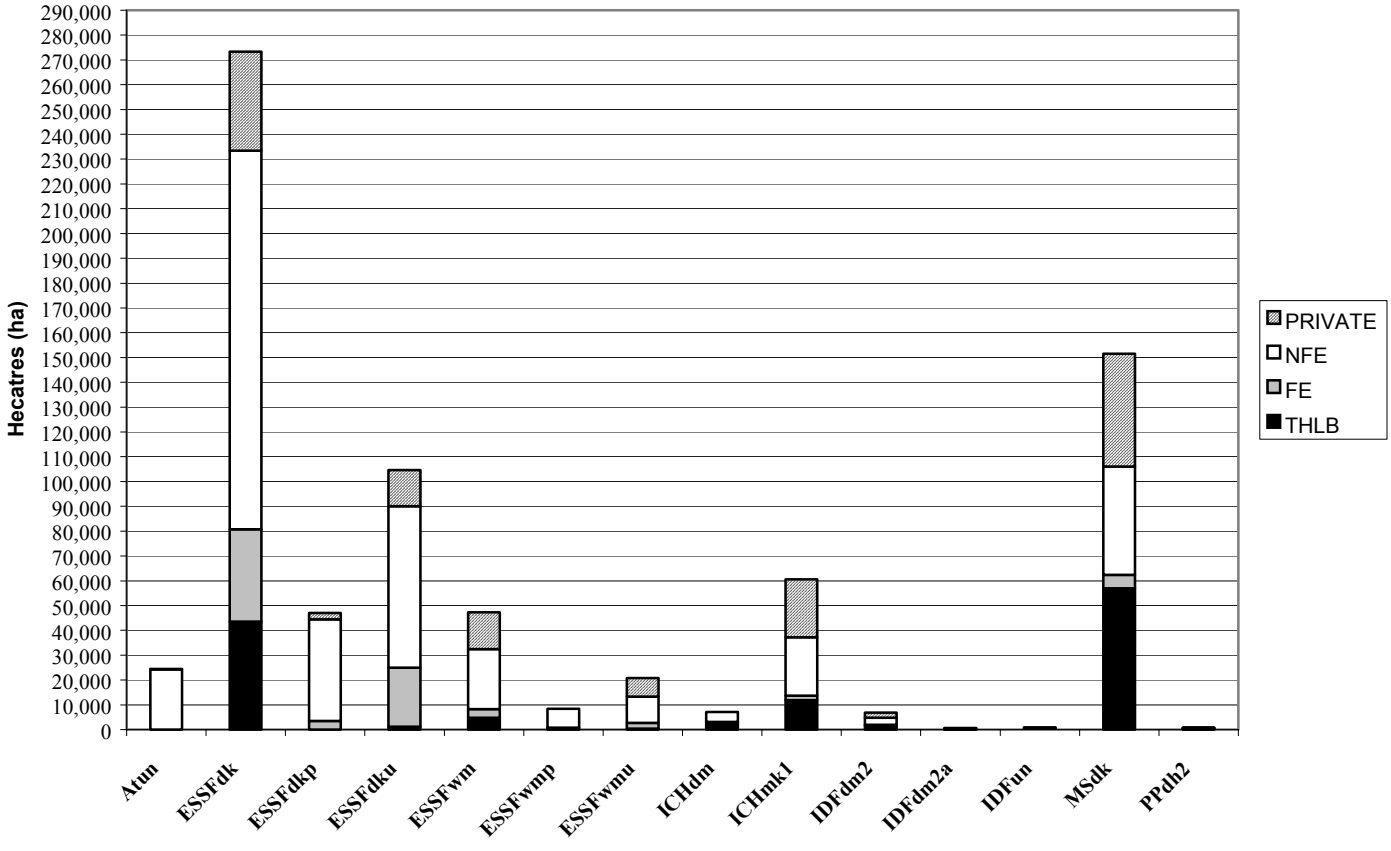


Fig. 1 The amount of land area (ha) represented in the Southern Rocky Mountain Management Plan area (Resource Evaluation Area) by biogeoclimatic subzone and land management categories. NFE = Non-forested exclusion; FE = Forested exclusion; THLB = Timber Harvesting Land Base.

4.70 Biodiversity

Background

Biodiversity is the diversity of plants, animals and other living organisms in all their forms and levels of organization and includes the diversity of genes, species, and ecosystems and the functional and evolutionary processes that link them. Biodiversity can be described at 3 levels: genetic, species and ecosystem. Genetic diversity refers to the different forms (alleles) of genes present in a particular population of living things. In a genetically diverse population, many forms of a gene are present, and because of this the population has the capability of adapting rapidly when local conditions change. A population that is not genetically diverse (e.g. an inbred or isolated population) has only a few forms of each gene, making it vulnerable to genetic diseases and less able to adapt to environmental changes.

Species diversity refers to the number of different living species in a particular area. When species become extinct, species diversity diminishes. Each species has its own particular set of environmental conditions under which it can live and breed, and chooses its habitat accordingly. Species diversity is dependent on the number of different habitats present. Species diversity within the SRMMP area is highest in lower elevation habitats represented by the PP, IDF and ICH biogeoclimatic subzones (Fig. 2). Although the MSdk and ESSFdk support relatively fewer species than valley bottom subzones, between 175-230 vertebrate species potentially occur in these two subzones, which dominate the plan area.

Ecosystem diversity refers to the number of different habitats available in a particular ecosystem, and is directly reflected in species diversity. Human activities tend to split, isolate or eliminate certain types of habitat while maximizing others. Conserving ecosystem diversity means maintaining all of the habitats naturally occurring in an area in sufficient quantities that allow the survival of all species associated with those habitats.

Maintenance of biodiversity is dependent on:

- Protecting and connecting large areas as ecological benchmarks at the regional level;
- Providing habitat variety and connectivity at the landscape (watershed) level; and
- Managing at the stand (site) level.

Biodiversity is threatened by loss of habitat due to fragmentation, alienation or degradation by industrial practices or by urban encroachment, and /or by more direct impacts on specific plant and animal species such as consumptive use by people or animals. In general, to maintain biodiversity, current scientific theory states that different structural stages should be maintained in the landscape in proportions, which allow the maintenance of wildlife populations dependent on each stage, and in proportions, which mimic the natural disturbance interval of the forest type.

4.1 Natural Disturbance Types

The SRMMP area is represented by four natural disturbance types (NDTs) including NDTs 2, 3, 4 and 5. NDT 3 comprises the majority of the gross plan area (66%) with the remaining area represented by NDT 5 (27%), NDT 2 (6%) and NDT 4 (1.2%) (Fig. 3). As a proportion of the timber harvesting land base (THLB), NDT 3 comprises almost all of the operable forest (93%). Of this, two biogeoclimatic subzones dominate the THLB including the MSdk (46.1%) and ESSFdk (35.3%).

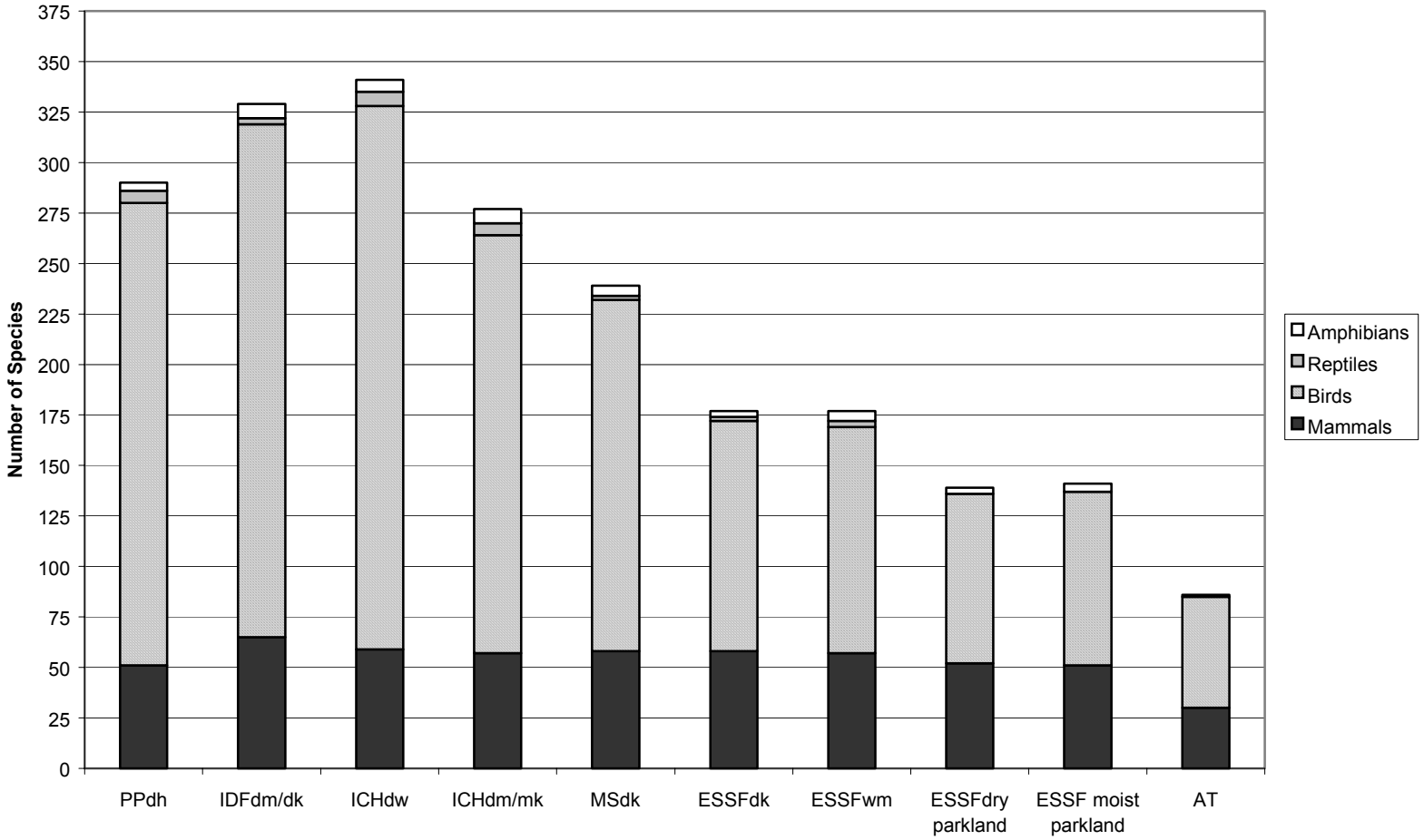


Figure 2. Species diversity by biogeoclimatic subzone. SRMMP. Source. Wildlife Diversity in British Columbia (1995).

Natural Disturbance Type 5 includes alpine tundra and subalpine parkland ecosystems (ESSFdkp, ESSdku, ESSFdmp, ESSFdmu, ESSFmwp, ESSFwmu). These are areas with short, harsh, growing seasons where fires or other types of disturbance such as grazing have dramatic and long-lasting effects.

Natural Disturbance Type 4 includes the, IDFdm and PPdh subzones, which are characterized by frequent stand-maintaining fires. Low-intensity fires are common and limit tree encroachment onto grasslands. Patches of fire-resistant trees occur throughout the IDF and PP in slightly moister areas, resulting in a natural mosaic of mostly uneven-aged forests interspersed with grassy and shrubby openings.

Natural Disturbance Type 3 is characterized by ecosystems with frequent stand-initiating fires and outbreaks of insect pests. These forests occur naturally in a mosaic of even-aged regenerating stands, usually containing mature forest remnants. Biogeoclimatic subzones represented by NDT 3 include the ESSFdk, MSdk, ICHdm, ICHdw, and ICHmk1.

Natural Disturbance Type 2 is characterized by ecosystems with infrequent stand-initiating events and includes the ESSFmw and ESSFdm subzones. Historically these ecosystems naturally experienced infrequent fires (B.C. Ministry of Forests 1995). The landscape naturally consisted of even-aged stands with snags and veteran trees remaining from previous burns.

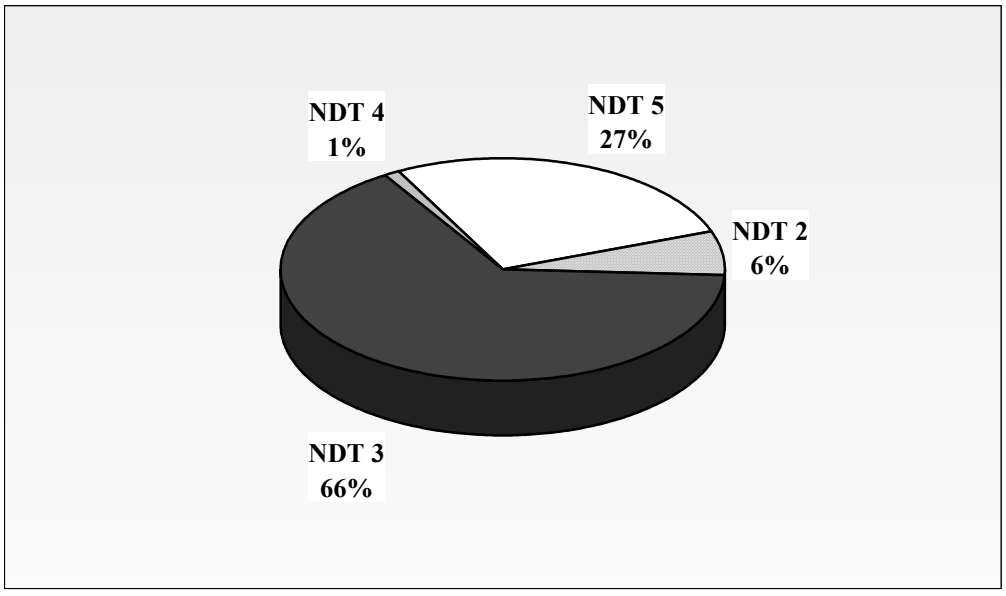


Figure 3. Proportion of each natural disturbance type (NDT) in the SRRMP area.

The implication for forest management of the relatively large proportion of the THLB that is represented by NDT 3 (total 66% of plan area) lies mainly with the harvesting patterns, seral stage distribution, patch size and degree of connectivity maintained in managed landscapes. A clustered harvest pattern with aggregated harvest units or retention of mature timber patches within aggregated harvest unit's mimics most closely the natural disturbance of fire and insect outbreaks in the NDT 3 subzones. To mimic the natural small-scale disturbances that naturally occur in NDT 2, harvesting patterns should be small (< 250 ha) and dispersed over the landscape.

5.0 Seral Stage Distribution and Old Growth

Background

Old-growth conservation is a concern because forest management emphasizes production of young, fast-growing even-aged forests with limited structural diversity and few large old trees. Old-growth forests provide structural components such as large old trees, multi-layered canopies, standing dead trees, decaying live trees, large logs on the forest floor (coarse woody debris) and in streams (large organic debris) and considerable amounts of arboreal lichens, all of which are less abundant in young forests and are important to many wildlife species (Pojar and Meidinger 1991).

As forest stands develop through time, the composition of plant and animal communities change. Some species are primarily associated with mature and old forests, while others use predominately early seral stages. Many plants and animals, however, use different seral stages throughout the year to meet seasonal requirements. To maintain biodiversity, the FPC *Biodiversity Guidebook* outlines seral stage objectives based on natural disturbance types (NDTs). Natural disturbances (e.g. fire, wind and insects) and their frequency have created forests with differing seral stage distributions. In general, forests with less frequent disturbances (e.g. ESSFmw) tend to be older than those that are disturbed more frequently (e.g., MSdk). Consequently, the types and numbers of plant and animal species adapted to each of these forest types vary. In general, species diversity tends to be greater in more productive valley bottom habitats (see Fig 2).

One of the primary threats to biodiversity is fragmentation of mature and old forests caused by forest harvesting practices and road development. Fragmentation is the process of reducing large contiguous forests into smaller forest patches and varies directly with the rate and pattern of timber harvesting. Fragmentation of old growth stands reduces the quality of wildlife habitats for several reasons including:

- the edges of old growth stands are poorer quality due to increased disturbance and climatic extremes;
- small stands are not suitable for species that require larger home ranges; and,
- animals moving between widely spaced old growth habitat may be subjected to higher rates of mortality.

For these reasons, the long-term viability of populations of some species may be lower in landscapes where their habitat is highly fragmented. Therefore, it is becoming widely recognized that forest management practices must be modified to better integrate timber harvesting and silviculture with ecological values. To achieve these objectives, especially for forests that are naturally disturbed relatively infrequently (i.e., NDTs 1& 2), will require increased use of selection harvesting systems designed to retain old growth attributes.

Current Status and Anticipated Trends

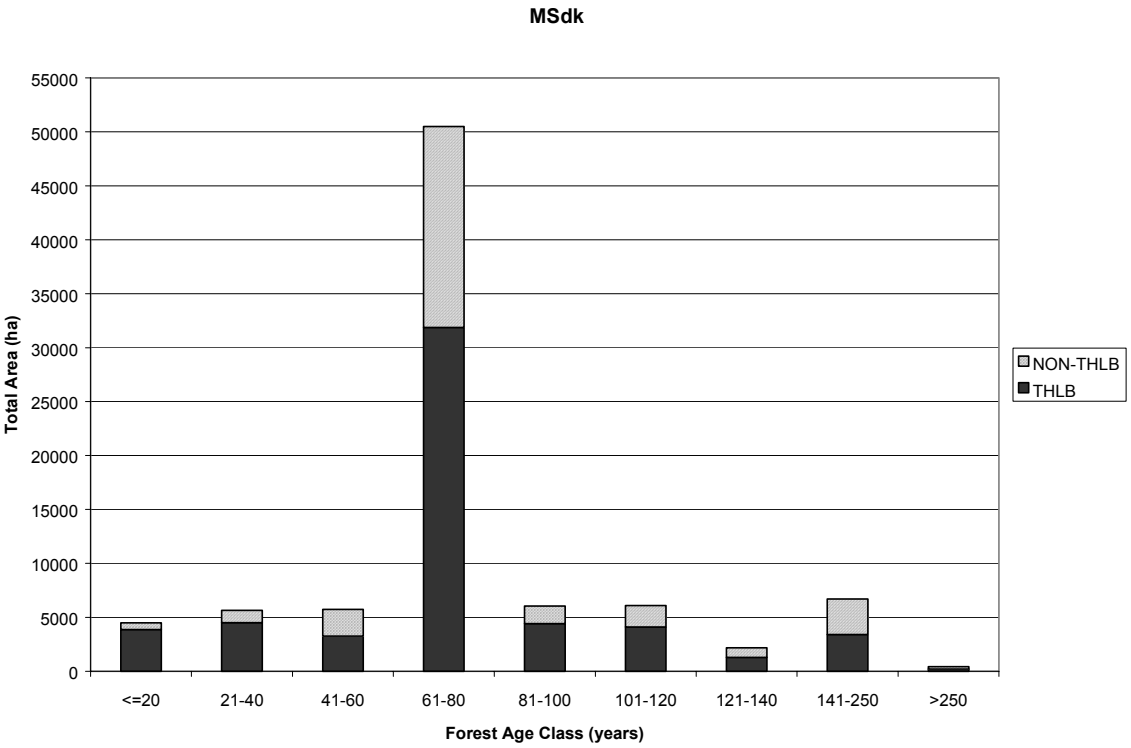
The provincial landscape unit planning process is undergoing changes, however, the general framework and priority initiatives identified in the Landscape Unit Planning Guide (1999) are anticipated to remain under the emerging guidelines for *Sustainable Resource Management Planning* as well as the results-based Forest Practices Code. As such, one of the primary elements of biodiversity planning identified in the LUPG is to establish objectives for old growth retention. Although the process of identifying old growth management areas (OGMAs) may have occurred in the absence of the SRMMP, the spatial establishment of OGMAs is also partly guided by the SRMMP, which confounds impacts attributable to either management regime. Nonetheless, a brief description of the existing seral stage distribution including old growth for the SRMMP area is provided below.

The SRMMP area contains a total crown forested land base (CFLB) of 310,405 ha. Of that, 123,495 hectares occurs on the current timber harvesting land base (THLB) and the remaining amount (186, 910 ha) is classified as non-contributing forested land. The THLB is distributed over 11 of 14 biogeoclimatic subzone variants, however, 90% of the THLB is represented by three subzones including the MSdk, ESSFdk and the ICHmk1 (Table 3).

Table 3. Total area (ha) of each biogeoclimatic subzone/variant in the SRMMP area by land base category.

Biogeoclimatic subzone/variant	Total THLB (ha)	Total non-contributing (ha)	Total crown forested land (ha)	% of total THLB
ESSFdk	43,552	100,168	143,721	35.3
ESSFdkp	0	514	514	0.0
ESSFdku	1,126	15,449	16,575	0.9
ESSFwm	4,732	13,950	18,682	3.8
ESSFwmp	0	396	396	0.0
ESSFwmu	395	2,831	3,226	0.3
ICHdm	2,927	2,670	5,597	2.4
ICHmk1	11,891	19,058	30,949	9.6
IDFdm2	1,563	755	2,318	1.3
IDFdm2a	98	198	296	0.1
IDFun	0	25	25	0.0
MSdk	56,933	30,867	87,800	46.1
NODATA	22	13	34	0.0
PPdh2	258	15	273	0.2
TOTAL	**123,495**	**186,910**	**310,406**	**100.0**

Source: SRMMP database (Cranbrook)



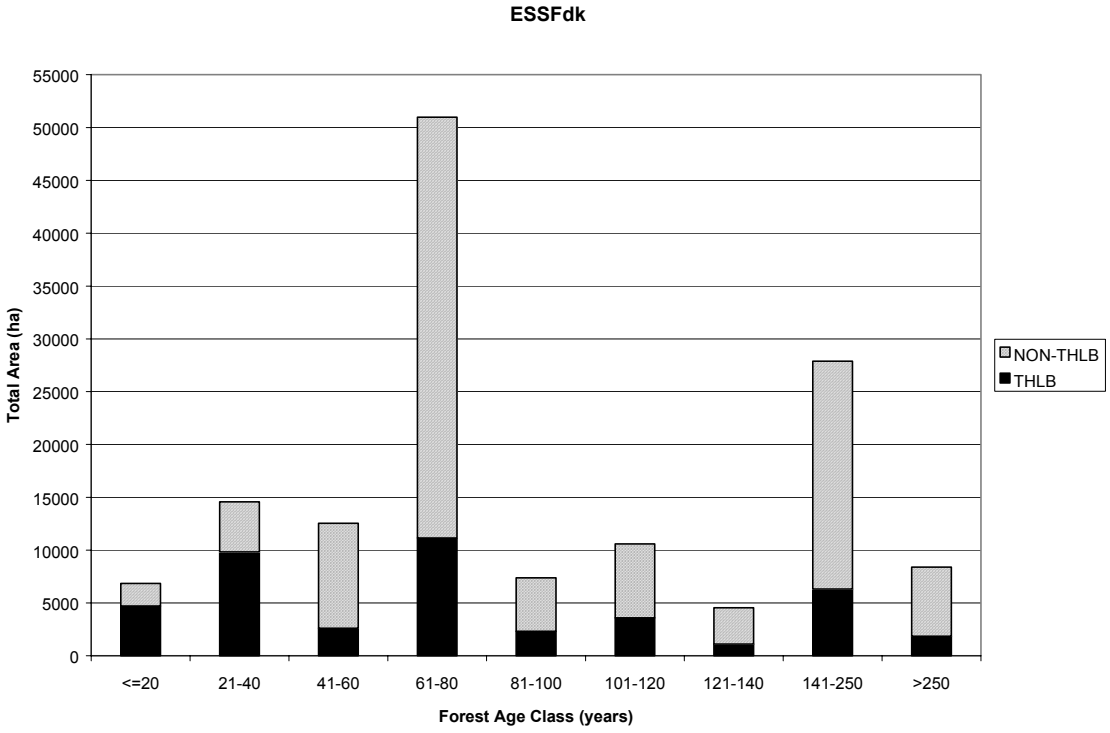


Figure 4. Current age class distributions of the MSdk and ESSFdk by timber harvesting land base (THLB) and forested areas outside the THLB – Southern Rocky Mountains Management Plan area.

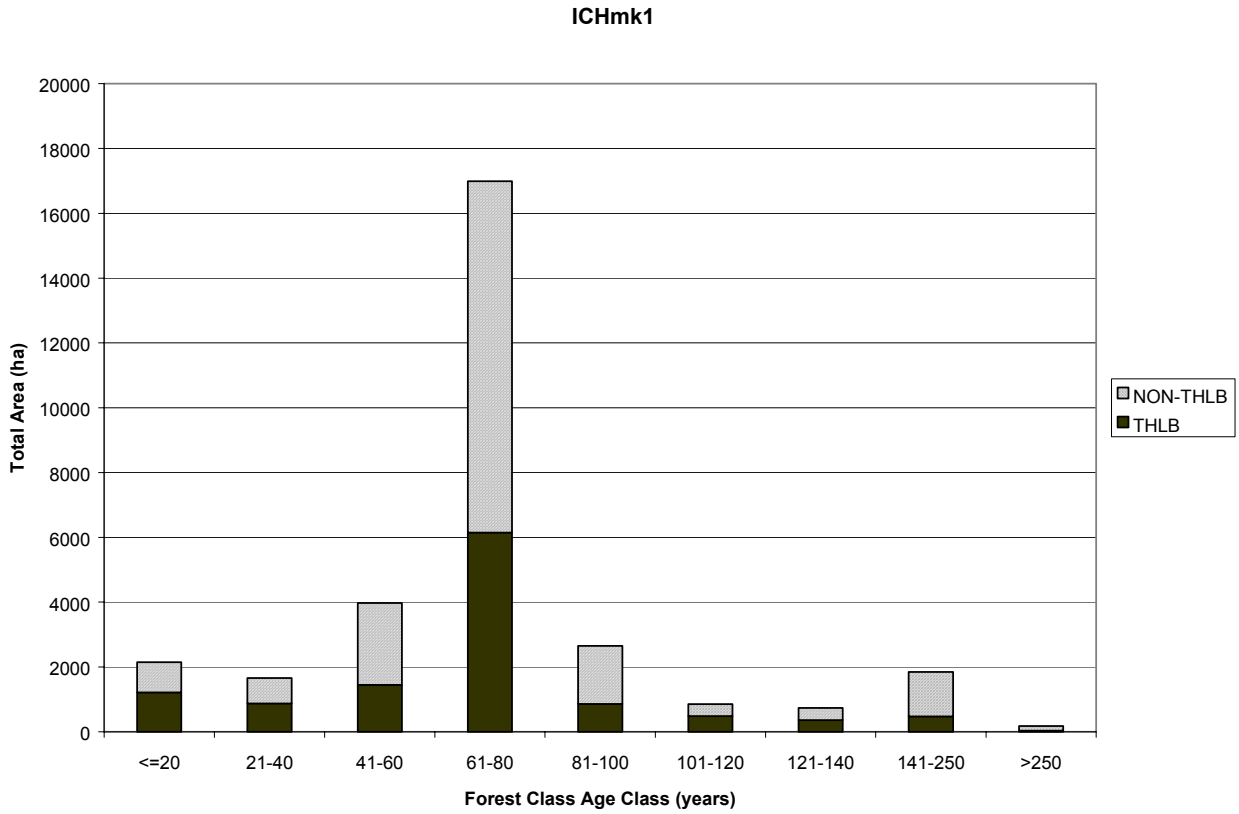


Figure 5. Current age class distribution of the ICHmk1 by timber harvesting land base (THLB) and forested areas outside the THLB – Southern Rocky Mountains Management Plan area.

The current age class distributions of the MSdk, ESSFdk and ICKmk1 are similar with most of the timber harvesting land base currently less than 80 years old, with many stands in the 61-80 year old age class (Figs 4 &5). This pattern also appears to be generally consistent in areas outside the timber harvesting land base. There are relatively few mature or old forest stands currently present in the MSdk and ICHmk1, however, there are greater amounts of mature and old forest in present in the ESSFdk non-contributing areas (Fig. 4).

In general, the long term risk to mature and old forest can be partly determined by examining the assigned Biodiversity Emphasis Options (BEO) for each Landscape Unit/BEC combination in the SRMMP area. Although this report could not address the relative abundance of mature and old forest over time, the previous analysis of the KBLUP-IS (1996) did provide an estimation of risk based on assigned BEOs and the deviation of seral stage distribution from natural levels over discrete time periods (0,20,70 and 250 years). Reviewing the landscape units that are contained in the SRMMP area indicated that over the short-term (next 20 years), valley bottoms habitats, particularly those that occur in the West Flathead, Wigwam, Lower Elk, West Elk, Upper Elk and Fording River Landscape Units are at high risk to very high risk. Over the mid to long term, risks decline to moderate-low levels in the Flathead and Wigwam but remain high throughout the Elk valley.

The current analysis indicates 79.4%, 18.5% and 2.1% of the total crown forested land base (CFLB) will be managed to meet Intermediate, High and Low biodiversity age class objectives respectively. As a proportion of the timber harvesting land base, less area will be managed to meet High Biodiversity age class objectives (10.9%) with slightly more forested land managed to meet Intermediate age class objectives (86.2%; Fig. 6).

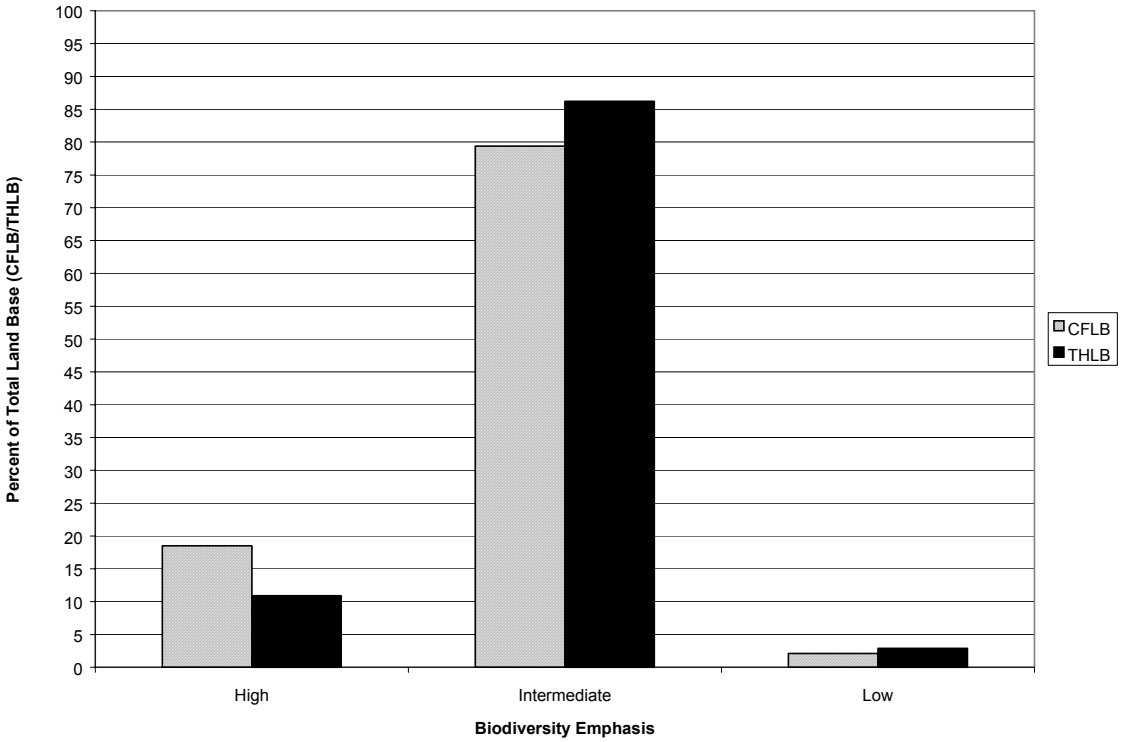


Figure 6. Proportion of crown forest land base (CFLB = 310,405 ha) and timber harvesting land base (THLB = 123,495 ha) managed to meet each Biodiversity Emphasis Option (BEO) – Southern Rocky Mountains Plan Area

The relatively large amount of Intermediate BEO assigned to most Landscape Unit/BEC combinations suggests "moderate to high" risk levels to coarse filter biodiversity elements (assuming 50% of natural quantities of mature and old forest are retained). In the short term, higher levels of risk are likely in Landscape Units where there is an existing deficit of mature and old forest. Depending on the BEO, risks to mature and old forest could decline overtime as mature and old forest are recruited and captured in OGMAs. Over the longer term, higher risk levels may become apparent in landscape units designated as Low BEO (i.e., <50% of natural mature and old retained).

Overall, the rate and extent of forest harvesting as well as specific management strategies (e.g., silvicultural systems, ecosystem-based management) will largely determine the extent to which old growth ecosystems will be maintained on the THLB. Although some mature and old forests will remain on the THLB to meet VQO objectives as well as other FPC requirements (e.g., *Riparian Reserve Zones*, *Wildlife Tree Patches*), there will be fewer large areas of mature and old forest present in valley bottom forests. While the Forest Practices Code requires stand level

biodiversity practices (e.g. wildlife tree patches) as well as retention of timber in riparian reserve zones, species dependent on large areas of mature and old forests will be most affected in the short term.

In order to reduce the risk to old growth, Old Growth Management Areas (OGMAs) need to be established that capture representative ecosystems including rare habitat types and/or areas with high wildlife values. In the absence of the SRMMP (i.e., Base Case) there will be fewer opportunities to identify appropriate areas, which will increase the risk that some high value old and mature forests may be harvested.

Ecosystem Representation and Rare Forest Types

No information is available at this time.

6.0 Wildlife Tree Retention

Background

As part of current government policy, the *Landscape Unit Planning Guide* (LUPG 1999) has identified wildlife tree retention as one of the priority stand-level management objectives to be implemented. A wildlife tree is any standing live or dead tree with special characteristics that provide valuable habitat for conservation or enhancement of wildlife (BGB 1995). In British Columbia, over 80 species of wildlife are dependent on wildlife trees to meet some aspect of their habitat requirements (feeding, denning, nesting).

The *Biodiversity Guidebook* provides suggested levels of wildlife tree retention based on biogeoclimatic subzone, total area available for harvest and the amount of area previously harvested without wildlife tree retention. In general, the LUPG (1999) adopted the wildlife tree retention targets in the *Biodiversity Guidebook* and together with the *Provincial Wildlife Tree Policy and Management Recommendations* are the main documents that guide current management practices related to wildlife tree retention. The LUPG also outlined timber supply modelling assumptions that indicated a portion of wildlife tree retention should come from constrained areas within the block, such as riparian reserve zones. The *Provincial Wildlife Tree Policy and Management Recommendations* provides guidance on the choice of appropriate wildlife trees and wildlife tree patches, and related best management practices (MOF 2000).

Current Status and Anticipated Trend

A recent provincial review indicated many cutblocks in the province including those in the Kootenays[5] are retaining some trees with moderate to high wildlife values, however, the total number of trees retained is generally low (<3 stems per ha), particularly the number of dead trees (MOF 2002). This is consistent with Steeger (2002) who reported wildlife tree retention levels in managed stands may be as low as 0.1-1snags/ha compared to 10-60 snags/ha in unmanaged stands. This suggests the supply of potential cavity nesting trees is declining and those species dependent on high value wildlife trees remain vulnerable under current management practices.

5 Wildlife tree retention surveys were conducted in the Arrow and Kootenay Lake Forest Districts

Although inoperable areas can contribute to the supply of wildlife trees over time, species dependent on existing wildlife trees on the THLB will remain at high risk, especially over the short term as the amount of mature and old forest declines. Improving the composition of wildlife tree patches and the establishment of OGMAs have the potential to partly reduce the risks to wildlife tree users as well as adhering to the ecological guiding principles outlined in the *Provincial Wildlife Tree Policy and Management Recommendations.*

7.0 Riparian Ecosystems

Background

Riparian habitats occur adjacent to water bodies including streams, rivers, lakes and wetlands. Riparian vegetation (trees/shrubs) provides an unusually large number of functions including the regulation of light and temperature regimes, nourishment for aquatic and terrestrial biota and act as a source of large organic debris. In addition, riparian areas regulate the flow of water and nutrients from uplands to streams and maintain biodiversity by supporting numerous ecosystem types and ecological processes. Species diversity tends to be very high in riparian areas because of the multiple vegetation layers that provide a variety of nesting sites, cover areas and food sources. Maintaining riparian corridors is essential in managed forests because they help maintain fundamental ecosystem processes including species dispersal, predator-prey relationships and hydrological functions. Some of the key riparian floodplain ecosystems in the plan area include the Flathead River, Wigwam and Elk Rivers

Current Status and Anticipated Trends

The *Forest Practices Code* (FPC) as well as the *Mineral Exploration Code* (MX Code) requires *Riparian Reserve Zones* around specific stream classes and water bodies. Depending on the stream classification (stream width), FPC reserve zones (i.e., no-harvest buffers) vary between 0-50 m. Although S3, S2 and S1 streams require 20,30 and 50m buffers respectively, no reserve zones are required for S4-S6 streams. Because some fish may be present in S4 streams, these headwater streams remain vulnerable to resource development practices. Overall, however, the FPC riparian reserve zones reduce the risks to S1, S2 and S3 stream classes and help maintain some riparian values (e.g., fish habitat, water quality).

Range management in riparian areas is currently guided by the FPC Riparian Management guidebook, which provides recommendations for "Best Management Practices". Riparian values must be addressed in all current range use plans. In the plan area, all range use plans address riparian values using the FPC guidebook.

The GIS summary indicated there are approximately 48,919 ha of riparian reserve and management zones identified in the SRMMP area (Table 4). The majority of riparian habitat has either been netted out of the THLB (35,406 ha) or occurs in inoperable areas leaving a total of 3,417 ha (~7% of total) on the THLB within Riparian Management Zones. It is worth noting that a relatively large amount of riparian habitat occurs on private land (10,096 ha or 20.6%).

Table 4. Area summary (ha) of riparian zone classes by land base category.

Riparian Zone	FE	NFE	PRIVATE	THLB	Total
Lake Management	650	1,138	333	277	2,398
Lake Reserve	22	44	13	0	79
Stream Management	2,635	20,528	6,161	2,406	31,729
Stream Reserve	989	8,768	3,371	0	13,129
Wetland Management	183	295	209	734	1,421
Wetland Reserve	24	130	9	0	163
Total hectares	**4,502**	**30,904**	**10,096**	**3,417**	**48,919**

FE = forested exclusions; NFE = non-forested exclusions: private = private land; THLB = timber harvesting land base.

In general, implementation of management practices outlined in the FPC *Riparian Management Area* and *Lake Classification and Lakeshore Management Guidebooks* suggests a significantly reduced impact on riparian habitats. Although the outlook is generally positive for hydrological processes as well as some plant and animal species (fish) dependent on riparian communities, the degree to which these potential benefits are realized is highly dependent on harvesting practices in the *Riparian Management Zone.* That is, maintaining mature and old forest attributes (e.g. wildlife trees) in areas outside the *Riparian Reserve Zone* will further reduce the impacts to riparian communities and processes. The HLPO (Objective 6), which requires a 30 m *Riparian Management Zone* will partly reduce the risks to riparian areas for S5 and S6 streams used for consumptive uses. However, the extent to which this provision applies to the SRMMP area is not clear at this time. Overall, the benefits of leaving narrow (20-50 m) riparian buffer zones to terrestrial wildlife will have less of a positive impact and may even be detrimental to some species (e.g., increased predation). A landscape-level approach is needed to provide better riparian corridor protection that encompasses headwater streams as well as floodplains downstream to maintain hydrologic connectivity and biodiversity.

8.0 Connectivity

Background

Landscape connectivity refers to habitat linkages that allow organisms to move and disperse through a landscape. Landscape connectivity depends on the degree of habitat fragmentation and the habitat affinities of the species and their ability to move across the landscape and effectively utilize spatially distributed resources (e.g., food, mates). The importance of landscape connectivity to ecosystems processes suggests that management strategies that emphasize dispersal rates should help maximize the benefit of conservation efforts. Overall, providing effective connectivity corridors is considered a key landscape element to maintain ecological processes. The difficulty, however, is defining connectivity in meaningful terms that can applied operationally.

Current Status and Anticipated Trends

The SRMMP area comprises a relatively intact ecosystem that links the Canada-USA border through the Flathead and Elk River watersheds. Connectivity corridors were identified by the KBLUP at a regional and sub-regional scale and provide guidelines for managing resource

activity within these areas. These corridors are designed to link the Protected Areas and Special Resource Management Zones in order to ensure that opportunities for movement of species and the associated genetic material can be maintained over time (KBLUP-IS 1997). Maintaining regional connectivity corridors in the SRMMP area is crucial to the long-term persistence of many wildlife populations, especially grizzly bears.

The GIS area summary indicated there are approximately 375,862 ha of proposed connectivity corridors identified in the SRRMP area. Of that, about 72,904 ha occurs on the THLB (19.4%), which is at potential risk from forest harvesting activities and further road development. Another 45,339 hectares (12%) occurs on private land and is also considered vulnerable to further settlement and resource development.

The connectivity corridors overlap a portion of each Landscape Unit in the plan area; however, the connectivity corridors are concentrated in the East Flathead, Upper Flathead, Wigwam, Sand Creek, Iron-Sulfur, and East Elk Landscape Units. The connectivity corridors are represented largely by the MSdk, ICHmk1, and ESSFdk biogeoclimatic subzones and will be managed predominately within the seral stage constraints of an Intermediate BEO (Table 5).

Table 5. Areal breakdown (ha) of connectivity corridors by biogeoclimatic subzone and Biodiversity Emphasis Option (BEO) – SRMMP area

BECLABEL	BEO - High	BEO – Inter	BEO - Low	Total THLB (ha)	Total Non-THLB (ha)	Total CFLB (ha)
ESSFdk	3288	17971	0	21259	57102	78361
ESSFdkp	0	0		0	284	284
ESSFdku	12	413	0	425	8382	8807
ESSFwm	80	2053		2133	8584	10717
ESSFwmp	0	0		0	64	64
ESSFwmu	0	193		193	861	1054
ICHdm		1796		1796	1564	3360
ICHmk1	1427	6780		8207	11729	19936
IDFdm2	96	0	1354	1449	423	1872
IDFdm2a		39		39	64	103
MSdk	6033	31028	84	37145	18580	55725
NODATA	0	0		0	0	0
PPdh2			258	258	15	273
TOTAL	**10937**	**60272**	**1695**	**72904**	**107651**	**180556**

Source: SRMMP Database: THLB = Timber Harvesting Land Base; CFLB = Crown Forested Land Base.

The Kootenay-Boundary HLP Order states that connectivity corridor objectives will be addressed using the mature and old forest seral target budgets available within each BEO/NDT combination. The current age class distribution of the connectivity corridors indicates all forest age classes are represented to some extent, however, about half (~76,805 ha) of the total amount of connectivity corridor is dominated by young and mid seral forests (61-80 years)(Fig. 6). Whether there is adequate mature and old forest to meet the connectivity corridor objectives is not clear at this time. Overall, the matrix of crown and private lands in the SRMMP area poses significant challenges to maintaining regional connectivity. As such the risks to species dependent on connectivity corridors remains high in the Elk Valley with somewhat lower risks (moderate) in the remaining SRMMP area.

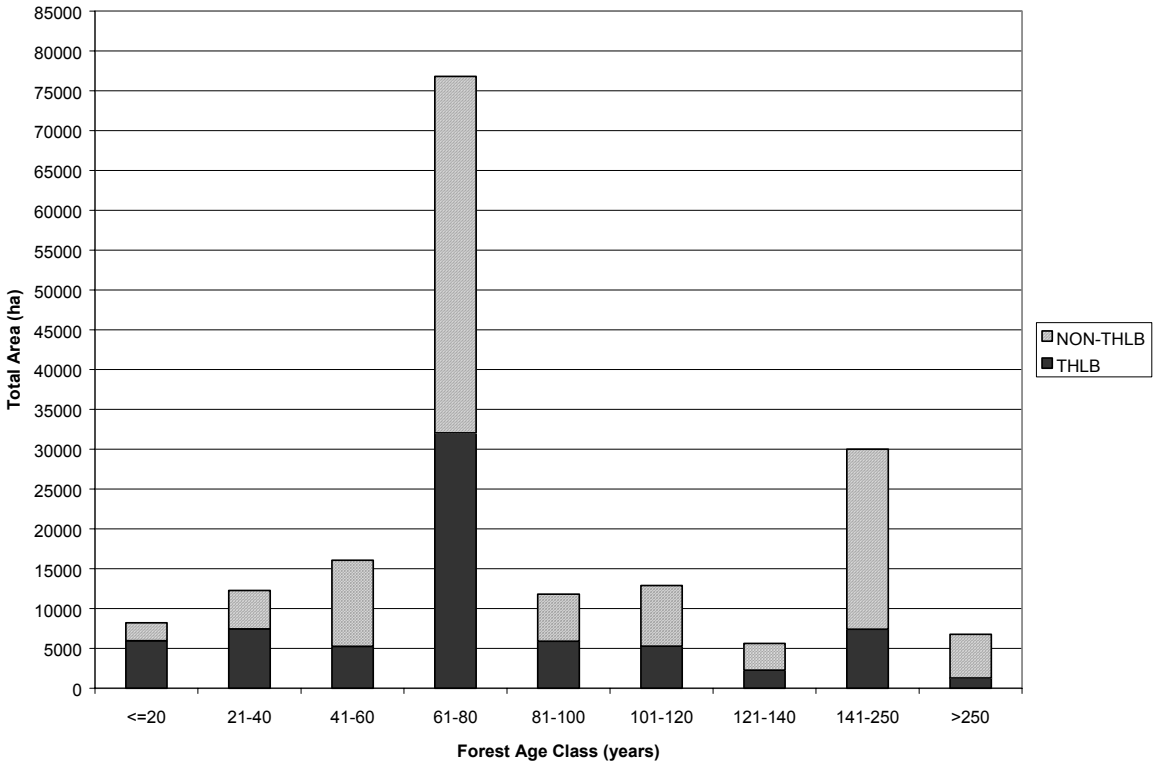


Figure 6. Current age class distribution within connectivity corridors for the timber harvesting land base (THLB) and forested areas outside the THLB. SRMMP

9.0 Ungulate Winter Range

Background and Assumptions

The SRMMP plan area supports a high diversity of ungulate species including white-tailed deer, mule deer, bighorn sheep, elk, moose and mountain goat. To maintain ungulate winter range at both stand and landscape levels, habitat attributes including preferred forage species, snow interception as well as thermal/security cover need to be appropriately distributed over space and time. This requires not only maintaining mature forest cover but also preventing forest in-growth of grassland and open forest communities for ungulates dependent on grazing habitats (e.g., elk, bighorn sheep). In addition, road access as well as commercial and non-commercial recreation activities (e.g., heli-skiing, snowmobiling, ATV) has the potential to adversely affect ungulate populations. Increased road access and human disturbance have the potential to increase physiological stress, habitat displacement and mortality risk (i.e., legal and illegal hunting pressures).

The Ministry of Water, Land and Air Protection (WLAP) is charged with identifying and establishing Ungulate Winter Ranges under the *Forest Practices Code* (FPC). Recent amendments to the *Operational Planning Regulation* (OPR) of the FPC have created a specific

definition and regulations to provide the legal basis for management of Ungulate Winter Ranges (UWR) on provincial forest land. A two-step process was approved for the establishment of UWR under the Regulation. Grandparenting of existing mapped winter ranges that had wildlife management plans and/or strategies, and were managed as UWR, was completed on October 15, 1998. The remaining candidate winter ranges include:

1) those that were previously mapped but not grandparented by October 15, 1998, and
2) those that were accounted for in TSR 1 but were not mapped.

All *Forest Practices Code* candidate and grandparented ungulate winter ranges are to be finalized as quickly as possible, and those meeting the conditions of the MOU confirmed by October 15, 2003. The overall intent is to: (1) identify the areas that are necessary for the winter survival of ungulates; (2) ensure that these areas are distributed in the most effective way for maintaining ungulates across their natural range; and (3) ensure that timber supply impacts do not exceed those included in Timber Supply Review I (TSR I). Although ungulate winter range is part of the SRMMP planning process, the establishment of UWRs is largely considered to be a Base Case management regime (i.e., UWRs would likely be established in the absence of the SRMMP).

Current Status and Anticipated Trends

Approximately 141,510 ha of ungulate winter range have been identified in the SRMMP area. Of that, a substantial proportion (33% or 47,377 ha) occurs on private land and remains vulnerable to development activities (e.g., mining, agriculture, human settlement). About 28% of the remaining ungulate winter range occurs on the timber harvesting land base (28%) and is considered at risk from forest harvesting activities. The remaining ungulate winter range (38.5%) overlaps areas outside the operable forest (Table 6).

Table 6. Areal breakdown (ha) of Ungulate Winter Range by land base category

SRMMP Land Category	Area (ha)	Percent of total
Timber harvesting land base (THLB)	39,635	28.0
Forested exclusions	7,442	5.3
Non-forested exclusions	47,056	33.2
Private Land	47,377	33.5
TOTAL	**141,510**	**100**

FE = forested exclusions; NFE = non-forested exclusions: private = private land; THLB = timber harvesting land base.

The KBLUP-IS (1997) and the *Timber Supply Review* (1999) recognized 4 types of Ungulate Winter Range grouped by landscape unit and biogeoclimatic unit. Different forest cover requirements have been applied according to ungulate winter range type and species present. Depending on winter range type, the management objectives stated that 30-50% of the ungulate winter range must be greater than 80 or 120 years old at any one time[6]. Although these forest cover constraints appear adequate to maintain thermal cover (low-moderate risk), ungulate winter range on private lands remains at higher risk.

The Columbia Basin Fish and Wildlife Compensation Projects also help to reduce the risks to ungulates by restoring native grassland foraging habitats through the development of Stand Management Prescriptions (SMP), Burn Plans, Pre-Burn Slashing and Prescribed Burning. Management objectives in place for the *Fire Maintained Ecosystem Restoration Program*

6 Ungulate Winter Range Mapping has recently been refined using Predictive Ecosystem Mapping. Proposed management objectives will reflect an ecosystem-based approach compared to a species-based approach.

(NDT4; open forest, open range) are also viewed as positive measures designed to maintain an adequate supply of grazing habitat. In addition, the interim commercial recreation guidelines as well as a number of *Access Management Areas* help reduce the risks associated with increased human disturbance and legal/illegal hunting pressures including:

- Wigwam Flats-Mt Broadwood/Sportsman Ridge Access Management Area (MU4-2). Closed year round to the operation of all vehicles
- McDougal Wildlife Sanctuary at Sage Creek (MU4-1) No hunting, trapping, firearms or vehicles
- Galton Range Access management Area (MU4-2)-
- Chauncy Todhunter – closed year round to all vehicles
- Weigert Creek Access – closed all year to all vehicles except snowmobiles.
- Upper Elk Valley-Fording River Access Management Area - closed all year to all vehicles except snowmobiles.
- Ridgemount Access Management Area
- Alexander Creek
- Corbin Creek Access Management Area

Overall, current management practices including the establishment of UWRs are viewed as positive because it provides increased certainty that ungulate winter range objectives will be met. However, the total area established as UWR under the FPC is limited by timber supply impacts, which often results in fewer areas established than desired. In summary, current management practices suggest low to moderate risks to ungulate populations. However, refining access and recreation management zones with effective management objectives and strategies would further reduce the risks to ungulate populations over the long term.

A brief summary of ungulate population status in the SRMMP area is provided below:

- According to WLAP staff, white-tailed deer and mule deer populations are stable to slightly increasing in the plan area (B. Forbes *pers.comm*)
- Mountain goats in Management Unit 4-23 are stable (B.Forbes *pers.comm*).
- Bighorn sheep herds are stable in the Bull River and Lizard (Elko), increasing in the Elk Valley but decreasing in the Wigwam (Teske and Forbes 2002). Disease (pneumonia), harsh winters and predation have apparently contributed to the decreasing trend.
- Following two harsh winters, recent survey area estimates suggest elk populations have increased since 1995-1996 (B.Forbes *pers.comm*), especially in MU-4-23 and 4-2.

10.0 Grizzly Bear

Background and Assumptions

Grizzly bears are provincially *blue-listed*[7] primarily because they require large wilderness areas, have low reproductive rates and are vulnerable to human disturbances. To reduce bear-human conflicts, it is generally accepted that grizzly bears require large relatively undisturbed areas (home range sizes ~ 350-2500 km^2). However, because large undisturbed areas exceeding thousands of square kilometres are rare, the majority of grizzly bear range will require some form of special management to ensure grizzly bear survival.

[7] BC Environment uses a 3 class system to rank vertebrate species according to their provincial degree of endangerment. *red-list* = endangered; *blue-list*-vulnerable/sensitive; *yellow-list* = not at risk, but may be regionally significant

Grizzly bears require a variety of seral stages to meet seasonal habitat requirements. Important spring habitats for grizzly bears in the East Kootenays include riparian areas, floodplain forests, and avalanche chutes. In addition, open timbered burns that provide abundant berry-producing shrubs (e.g. soopolallie, huckleberries) are used extensively as foraging areas throughout the summer months.

Most of the potential threats to grizzly bear populations are related to human access, which results in higher mortality rates. Because road access poses high risks to grizzly bear survival, the amount of land remaining unroaded or where road densities are minimized typically provides the least risk to grizzly bears. Although grizzly bears have been shown to tolerate moderate rates of resource development (McLellan 1989), in general, fewer km of open roads decrease the probability of bear-human encounters which typically provide better bear habitats and increase the chance of bear survival (McLellan and Shackleton 1988; McLellan 1990; Mace *et al*. 1996). Overall, the ability for landscape units to provide high quality grizzly bear habitat is related to the amount of foraging habitat (both forested and non-forested areas) maintained as well as the extent of open roads (i.e., road density) and their level of human use.

Because grizzly bears are sensitive to specific land uses, sub-regional planning processes (LRMPs, SRMPs) can provide the necessary spatial scale (i.e., thousands km^2) to meet their needs for relatively large areas. To address this requirement, the *Grizzly Bear Conservation Strategy* (1995) recognized land and resource management planning processes as the primary initiative to address landscape level requirements including the establishment of Grizzly Bear Management Areas (GBMAs). As such, grizzly bears are considered a higher level plan species where additional management direction is needed to meet their landscape level requirements, especially as they relate to seral stage distribution and road access.

The SRMMP area contains portions of three Grizzly Bear Population Units (GBPU) including the South Rockies, Flathead and Yaak. The Rockies and Flathead GBPUs are estimated to be healthy viable populations whereas the Yaak is listed as threatened[8]. The Flathead watershed supports the highest density of interior grizzly bears in North America. The watershed functions as the center of the linkage between the Northern Continental Divide Ecosystem population in the United States and contiguous populations of grizzlies in Canada and as a recruitment source for Alberta, the state of Montana and adjacent watersheds in British Columbia.

Current Status and Anticipated Trends

The KBLUP *Implementation Strategy* (1997) outlined grizzly bear management guidelines that addressed maintenance of critical feeding areas as well as access management. Those guidelines apply to Grizzly Bear Priority Areas, which have been grouped into three classes (high, medium, low) based on habitat suitability. In addition, the Higher Level Plan Order includes provisions to maintain mature and/or old forest adjacent to avalanche chutes important to grizzly bears (Objective # 5). The amount of mature and old forest available, however, is dependent on how much remains after complying with other HLPO objectives (e.g., OGMAs, caribou). As such, the extent to which this objective can be applied across the plan area is unclear at this time. Although the overall intent of the HLPO objective is positive because it could reduce disturbance and potential displacement from grizzly bear feeding and security areas, implementation of this objective has been contingent on the completion of avalanche chute mapping, which has only recently been completed. Hence, this objective has the potential to maintain habitat effectiveness

8 A threshold of 50% of minimum habitat capability arbitrarily defines "threatened" (<50%) and "viable" (>50%) (WLAP)

in the future; however, until the objective is fully implemented operable portions of these grizzly bear habitats remain vulnerable to forest harvesting activities.

The GIS analysis indicated a large percentage of the SRMMP area (73%) contains high and medium grizzly bear priority areas (554,095 ha; Table 7). Of the total grizzly bear habitat identified (639,677 ha), 18.6% occurs on the timber harvesting land base and another 20.5% occurs on private land. The remaining amount is distributed between forested and non-forested exclusions, which occur outside the timber harvesting land base.

Table 7. Areal breakdown of grizzly bear priority areas by land base category. SRMMP

Grizzly Bear	FE	NFE	PRIVATE	THLB	Total
1 (Highest Priority)	26,026	115,705	10,371	49,878	201,980
2 (Medium Priority)	35,314	157,398	92,182	67,221	352,115
3 (Lowest Priority)	7,063	47,630	28,746	2,143	85,581
Total hectares	**68,404**	**320,732**	**131,299**	**119,242**	**639,677**
(% of total)	**(10.7%)**	**(50.1%)**	**(20.5%)**	**(18.6%)**	**(100%)**

FE = forested exclusions; NFE = non-forested exclusions: private = private land; THLB = timber harvesting land base.

This area summary suggests about 39% of grizzly bear habitat is at risk from resource development activities that occur on both crown (THLB) and private land. Because there are opportunities to more easily mitigate the potential adverse effects on crown land, the grizzly bear habitat on private land poses somewhat higher risks.

Of the grizzly bear habitat that occurs on the timber harvesting land base, the BEO seral stage distributions will affect landscape level forage requirements of grizzly bears. As mentioned previously most of the SRMMP area including the high priority grizzly bear areas will be managed to meet Intermediate biodiversity age class objectives. Whether an Intermediate BEO is compatible with maintaining grizzly bear habitat requirements will largely depend on available seral budgets as well as where and how the mature and old forest is distributed within each landscape unit. If the mature and old forests are retained, for example, in a *Forest Ecosystem Network* (FEN) that includes high elevation feeding areas, timbered areas encompassing avalanche chutes as well as valley bottom riparian areas, then Intermediate Biodiversity may provide adequate habitat conditions and pose only moderate risk levels to grizzly bear habitat. However, if the mature and old forests are concentrated only in inoperable areas or poor productivity sites then clearly the risks to bears are much higher as seasonal habitats remain vulnerable.

In addition to seral stage distribution, there are a number of other factors that influence grizzly bear survival including road access (forestry, mining, recreation), permanent settlements (private land) and the development of large commercial recreation facilities. All of these factors have the potential to increase bear-human conflicts and increase grizzly bear mortality risk. In areas outside of parks (e.g., Akamina-Kishinena), there needs to be effective access and recreation management strategies developed and implemented that will minimize the risks to grizzly bears to ensure long term population survival.

Overall, the relative risks to grizzly bears will vary throughout the plan area. Risks will remain high on private land as well as areas where seral stage distribution may be incompatible over the long term such as Low BEOs. However, over the majority of SRMMP area, risks are moderate assuming the HLPO and KBLUP-IS is fully implemented.

11.0 Other Wildlife and Plant Species at Risk

Background

Conservation Data Centre (CDC) is charged with the task of tracking the status of wildlife species and plant communities at risk in the province. The listed rare plant communities typically include those that are: (i) rare or uncommon on the landscape; (ii) contain unique species or elements; or (iii) declining in representation due to alienation from the forest land base or stand conversion. There are a total of 10 red-listed and 6 blue-listed plant communities in the Cranbrook Forest District. Most of these occur in the IDF and PP biogeoclimatic zones (see Appendix 2.). The CDC has also identified a total of 18 blue and 10 red-listed wildlife species in the Cranbrook Forest District. Of these, all of them are known to occur or have the potential to occur in the SRMMP area, except mountain caribou.

Current Status and Anticipated Trend

The outlook for wildlife species at risk as well as rare plant communities is somewhat mixed. Some wildlife species, for example, may be adequately addressed as part of the *Identified Wildlife Management Strategy* (IWMS) through the establishment of Wildlife Habitat Areas (WHAs) or implementation of recommended general wildlife measures. However, other species have yet to be identified in Volume I or II and many management strategies outlined in the IWMS remain discretionary. How the IWMS will be implemented under the new results-based Forest Practices Code also remains unclear, which creates additional uncertainty.

Specific gaps in current management include tailed frog habitat, which remains vulnerable because they use riparian forests and small non-fish bearing streams (e.g. S5), which have no riparian buffer zone under the FPC. Although nest trees are protected under the Wildlife Act, Northern Goshawk habitat remains vulnerable due to declining interior forest conditions. Although some wildlife species that require higher level plan direction to meet landscape level management objectives have been addressed in the HLPO (e.g., grizzly bear) other IWMS species (e.g., bull trout, fisher) remain at moderate to high risk due to a lack of (legally binding) higher-level plan management direction.

120.0 Furbearers (Marten)

Background and Assumptions

Marten require relatively large areas of mature and old growth conifer forests with abundant coarse-woody debris to provide suitable foraging and denning habitat. Although marten populations have been shown to benefit from some forest harvesting within their home range (early seral stages provide habitat for some small mammals which in turn can increase their prey base), marten densities tend to decline proportionately with decreasing amounts of mature and old conifer forests (Thompson 1994; Thompson and Harestad 1994). Therefore, a High Biodiversity Emphasis Option would provide age class objectives most compatible (least risk) with maintaining mature forests as well as forest interior conditions required by marten.

Current Status and Anticipated Trends

Because about 18.5% of the SRMMP area will be managed to meet High biodiversity age class objectives suggests relatively low to moderate risks for marten populations in these areas. However, most of the plan area will be managed to meet Intermediate biodiversity age class objectives, which will result in a decline of mature and old forests and reduced habitat suitability. Furthermore, the TSR (1999) indicated less area of mature and old forests over the next 50 years (region wide), which may result in marten densities eventually declining to lower levels than present. However, because areas excluded from timber harvesting may provide some suitable habitat, the extent to which marten populations could decline is not clear. Nonetheless, managing more marten habitat to meet at least High biodiversity age class objectives and using alternative silvicultural systems may partly reduce the potential impacts by maintaining old growth attributes (e.g., large trees, coarse woody debris).

13.0 Fisheries

Background and Assumptions

The maintenance of the fishery resource is dependent upon the preservation of freshwater aquatic habitat for spawning, incubation and rearing. Forestry, mining, agricultural development and urban development have the potential to impact aquatic ecosystems by altering riparian areas which have direct and indirect effects on water quantity and quality. Riparian areas along streams and lakes act as filter strips that trap sediment and sideslope debris from adjacent roads and harvested areas. Removal of riparian trees can result in excessive sedimentation, which reduces water quality (dissolved oxygen) required to support salmonid eggs and alevins. Tree removal within riparian areas reduces a number of important fish habitat components including Large Organic Debris (LOD) sources, litterfall and food production of streamside areas. Removal of riparian trees can also decrease channel and bank stability and increase water temperatures. Overall, reduction in habitat diversity and stream productivity can result in reduced fish availability and species diversity. In addition to habitat related concerns, fishery resources are vulnerable to over-exploitation.

The Elk, Flathead, Wigwam and Bull Rivers as well as their tributaries are the major fish bearing streams in the SRMMP area. These rivers support a variety of fish species including mountain white fish, longnose sucker, kokanee, brook trout, rainbow trout, as well as three blue listed species: mottled sculpin, westslope cutthroat trout and bull trout. Bull trout are extremely sensitive to habitat degradation. They have more specific habitat requirements than other salmonid species and require well-oxygenated water within narrow cold temperatures and therefore are considered an indicator of ecosystem health. Distribution and abundance are strongly influenced by channel and hydrologic stability, substrate composition, cover, temperature. Maintenance of migration corridors is critical to reduce fragmentation of habitat.

Current Status and Anticipated Trend

The protection of environmental resource values, including fish and fish habitat, is a stated objective of the *Forest Practices Code of British Columbia Act* (FPC) introduced in 1995. Relevant components of the FPC and associated guidebooks provide protection for fisheries resources through watershed assessments, the establishment of riparian reserve and management

zones, fisheries sensitive zones, and stringent stream crossing and road deactivation requirements. Watershed assessments, especially those streams with significant downstream fisheries values are also expected to be an integral component of the new results-based Forest Practices Code.

Watershed assessment procedures developed for the FPC have become an essential analytical tool for evaluating the cumulative effects of development activities on the natural hydrologic and sediment transport regimes of rivers throughout the Province. Watershed assessments provide a framework to evaluate the development status of watersheds and consider many variables such as terrain sensitivity, roads, and equivalent clearcut area[9]. Operational guidelines for community and domestic watersheds were also outlined in the KBLUP-IS (1997)

The potential for forestry and mining development activities to negatively impact fish and fish habitat will likely increase as resource development pressures increase over time. Although we do not know the exact amount of road development that will occur in the future, new roads will be built to gain access to merchantable timber as well as to new mine sites. Therefore, the potential for future road development to negatively impact fish habitat will increase over time. However, recommendations outlined in the FPC *Riparian Management Area Guidebook* partly reduce the risk to fisheries values. Overall, the risk to fish habitat is moderate, however, risks are higher for smaller streams (S4, S5, S6) due to a lack of adequate protection. In addition, a lack of a complete inventory for bull trout (a blue-listed species) suggests bull trout populations remain at risk.

14.0 Conclusions

The information presented in this Base Case report suggests although some environmental values in the SRMMP area are receiving adequate protection and management, certain wildlife species and elements of biodiversity (e.g., old growth, coarse woody debris) remain at high risk. This is largely due to a number of factors including:

- the large amount of private land
- limitations of existing policies (e.g., LUPG)
- rate of forest harvest and cumulative impacts (mining/oil and gas)
- the fact that many components of the KBLUP-IS including the HLPO have yet to be fully implemented and landscape unit objectives are not in place.

Although there will be provisions in the results-based Forest Practices Code to protect environmental values (e.g., ungulate winter range), specific details regarding the regulations remain uncertain at this time.

Careful attention to the distribution of mature forest retention during landscape unit or SRMP planning may mitigate some of the potential impacts and risks associated with reduced amounts of mature forest cover. This may be especially important in landscape units designated as Intermediate BEO because many of the regionally significant wildlife values occur in these areas. Similarly, effective and achievable recreation and access management strategies need to be clearly defined and implemented during the SRMMP process. This is crucial because the risks associated with increased road access will continue to increase over time as potential recreation

9"Equivalent Clearcut Area" is the proportional area of forest within a watershed unit that is at an equivalent state of hydrologic recovery as a recent clear-cut, which is determined by applying a reduction factor based on stand age to account for hydrologic recovery due to forest regeneration.

forestry, oil and gas as well as mineral exploration/development activities proceed. The magnitude of the potential impacts will largely depend on the extent of development and the management strategies implemented to mitigate the potential effects.

It should be emphasised that the ability of each species to respond to disturbance and their ability to cope with a changing environment (i.e. resilience) varies among species. We know, for example, that some species are more resilient than others, so the relative risks to these species are somewhat less than those that are less resilient (e.g., area or dispersal-limited species such as grizzly bears and tailed frogs).

Overall, current management practices within the SRMMP suggests species dependent on early seral forests will benefit the most whereas species dependent on old forest structures (wildlife trees, coarse woody debris) and/or large contiguous areas of old growth (forest interior conditions) remain at moderate to high risk in the short and long term. Although the HLPO will help reduce the risks to specific components of biodiversity, comprehensive access management and recreation land use zoning including landscape level management direction from the SRMMP is required to maintain the significant conservation values in the East Kootenays. Some of the management recommendations set out in the KBLUP-IS (1997) should continue to be implemented as they offer ways of reducing risks to biodiversity.

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Appendix 1.0 The amount of crown forest land base (CFLB) by Landscape Unit and Biogeoclimatic subzone/variant

		Biodiversity Emphasis Option		
LU_NAME	BECLABEL	High (ha)	Intermediate (ha)	Low (ha)
Alexander - Line	ESSFdk		6346	
Alexander - Line	ESSFdkp		7	
Alexander - Line	ESSFdku		1184	
Alexander - Line	IDFun		25	
Alexander - Line	MSdk		2107	
Corbin Creek	ESSFdk			2471
Corbin Creek	ESSFdkp			3
Corbin Creek	ESSFdku			459
Corbin Creek	MSdk			372
Corbin Creek	NODATA			0
East Elk	ESSFdk			3
East Elk	MSdk			1055
East Flathead	ESSFdk		19597	
East Flathead	ESSFdkp		4	
East Flathead	ESSFdku		1291	
East Flathead	MSdk		20442	
East Flathead	NODATA		1	
Fording River	ESSFdk		9570	
Fording River	ESSFdkp		34	
Fording River	ESSFdku		1734	
Fording River	MSdk		869	
Galbraith - Dibble	ESSFdk		3876	
Galbraith - Dibble	ESSFdkp		3	
Galbraith - Dibble	ESSFdku		295	
Galbraith - Dibble	ESSFwm		6276	
Galbraith - Dibble	ESSFwmp		150	
Galbraith - Dibble	ESSFwmu		1288	
Galbraith - Dibble	ICHdm		2203	
Galbraith - Dibble	ICHmk1		8388	
Galbraith - Dibble	IDFdm2		57	
Galbraith - Dibble	MSdk		5436	
Galton Range	IDFdm2			902
Galton Range	MSdk			91
Iron - Sulphur	ESSFdk		3970	
Iron - Sulphur	ESSFdku		590	
Iron - Sulphur	ESSFwm		4592	
Iron - Sulphur	ESSFwmp		27	
Iron - Sulphur	ESSFwmu		418	
Iron - Sulphur	ICHmk1		10837	
Iron - Sulphur	IDFdm2		128	
Iron - Sulphur	MSdk		2291	

Jaffray - Baynes Lak	IDFdm2			798
Jaffray - Baynes Lak	PPdh2			273
Lodgepole - Bighorn	ESSFdk		8403	
Lodgepole - Bighorn	ESSFdku		451	
Lodgepole - Bighorn	ESSFwm		2697	
Lodgepole - Bighorn	ESSFwmp		41	
Lodgepole - Bighorn	ESSFwmu		727	
Lodgepole - Bighorn	ICHmk1	3359		
Lodgepole - Bighorn	IDFdm2	92		
Lodgepole - Bighorn	MSdk	5213		
Lower Elk	ESSFdk	523		
Lower Elk	ESSFdku	170		
Lower Elk	ESSFwm	2488		
Lower Elk	ESSFwmp	178		
Lower Elk	ESSFwmu	668		
Lower Elk	ICHmk1	8364		
Lower Elk	IDFdm2	149		
Lower Elk	MSdk	1332		
Sand Creek	ESSFdk		1295	
Sand Creek	ESSFdku		168	
Sand Creek	ESSFwm		2628	
Sand Creek	ESSFwmu		124	
Sand Creek	ICHdm		3394	
Sand Creek	IDFdm2		191	
Sand Creek	IDFdm2a		296	
Sand Creek	MSdk		2001	
Upper Bull	ESSFdk		15507	
Upper Bull	ESSFdkp		119	
Upper Bull	ESSFdku		1903	
Upper Bull	MSdk		8774	
Upper Bull	NODATA		25	
Upper Elk	ESSFdk		15742	
Upper Elk	ESSFdkp		39	
Upper Elk	ESSFdku		1978	
Upper Elk	MSdk		5078	
Upper Elk	NODATA		8	
Upper Flathead	ESSFdk		10885	
Upper Flathead	ESSFdkp		115	
Upper Flathead	ESSFdku		1933	

Upper Flathead	MSdk		1124	
West Elk	ESSFdk	12630		
West Elk	ESSFdkp	136		
West Elk	ESSFdku	2729		
West Elk	MSdk		12264	
West Elk	NODATA		0	
West Flathead	ESSFdk		20907	
West Flathead	ESSFdkp		54	
West Flathead	ESSFdku		1019	
West Flathead	MSdk		12550	
West Flathead	NODATA		0	
Wigwam River	ESSFdk	11996		
Wigwam River	ESSFdku	673		
Wigwam River	MSdk	6802		
TOTAL	**310406 (100%)**	**57502 (18.5%)**	**246476 (79.4%)**	**6428 (2.1%)**

Appendix 2.0 A list of red and blue-listed vertebrate species and rare plant communities known to occur or have the potential to occur in the SRMMP area (CDC 2002).

Common Name	Scientific Name	Provincial List
BIRDS		
White-throated Swift	*Aeronautes saxatalis*	BLUE
Great Blue heron, *herodias* subspecies	*Ardea herodias herodias*	BLUE
Short-eared Owl	*Asio flammeus*	BLUE
American Bittern	*Botaurus lentiginosus*	BLUE
Swainson's Hawk	*Buteo swainsoni*	RED
Bobolink	*Dolichonyx oryzivorus*	BLUE
Prairie Falcon	*Falco mexicanus*	RED
Peregrine Falcon, *anatum* subspecies	*Falco peregrinus anatum*	RED
Sandhill Crane	*Grus canadensis*	BLUE
Lewis's Woodpecker	*Melanerpes lewis*	BLUE
Long-billed Curlew	*Numenius americanus*	BLUE
Flammulated Owl	*Otus flammeolus*	BLUE
Western Screech-Owl, *macfarlanei* subspecies	*Otus kennicottii macfarlanei*	RED
Williamson's sapsucker, *nataliae* subspecies	*Sphyrapicus thyroideus nataliae*	RED
Sharp-tailed Grouse, *columbianus* subspecies	*Tympanuchus phasianellus columbianus*	BLUE
MAMMALS		
Southern Red-backed Vole, *galei* subspecies	*Clethrionomys gapperi galei*	BLUE
Wolverine, *luscus* subspecies	*Gulo gulo luscus*	BLUE
Fisher	*Martes pennanti*	BLUE
Northern Long-eared Myotis	*Myotis septentrionalis*	BLUE
Bighorn Sheep	*Ovis canadensis*	BLUE
Least Chipmunk, *oreocetes* subspecies	*Tamias minimus oreocetes*	BLUE
Red-tailed Chipmunk, *ruficaudus* subspecies	*Tamias ruficaudus ruficaudus*	RED
Badger	*Taxidea taxus*	RED
Grizzly Bear	*Ursus arctos*	BLUE
AMPHIBIAN		
Rocky Mountain Tailed Frog	*Ascaphus montanus*	RED
Northern Leopard Frog	*Rana pipiens*	RED
REPTILE		
Painted Turtle	*Chrysemys picta*	BLUE

Appendix 2.0 con't – Red and Blue-listed plant communities

Scientific name	English name	Biogeoclimatic Site Unit(s)	Provincial Rank	Provincial List
Anemone occidentalis - Carex nigricans	Western pasqueflower - black alpine sedge	AT ESSFdkp/00 ESSFwcp1/00	S2	Red
Betula nana / Equisetum	Scrub birch / horsetail	IDFdm2/06	S3	Blue
Distichlis stricta - Hordeum jubatum	Saltgrass - foxtail barley	IDFdm2/00	S1	Red
Picea engelmanii x glauca - Larix occidentalis - Mahonia aquifolium	Hybrid white spruce - western larch - Oregon-grape	IDFdm2/05	S2	Red
Picea engelmanii x glauca / Ribes lacustre / Aralia nudicaulis	Hybrid white spruce / gooseberry / sarsaparilla	ICHmk1/05	S3?	Blue
Pinus ponderosa - Populus tremuloides / Rosa woodsii	Ponderosa pine - trembling aspen / rose [Solomon's seal]	PPdh2/03	S1	Red
Pinus ponderosa / Pseudoroegneria spicata - Lupinus	Ponderosa pine / bluebunch wheatgrass - lupine	PPdh1/01 PPdh2/01	S2	Red
Populus balsamifera ssp. *trichocarpa / Cornus stolonifera - Rosa nutkana*	Black cottonwood / red-osier dogwood - Nootka rose	PPdh2/04	S1S2	Red
Pseudoroegneria spicata - Koeleria macrantha	Bluebunch wheatgrass - junegrass	IDFuu/00 IDFdm1/02 PPdh2/02a PPdh2/02b	S2	Red
Pseudotsuga menziesii - Larix occidentalis - Picea / Calamagrostis rubescens	Douglas-fir - western larch - spruce / pinegrass	IDFdm1/05 IDFdm2/04	S3	Blue
Pseudotsuga menziesii - Penstemon fruticosus - Calamagrostis rubescens	Douglas-fir - penstemon - pinegrass	ICHmk1/02 MSdm1/02	S3	Blue
Pseudotsuga menziesii - Pinus contorta - Alnus viridus ssp. *sinuata - Calamagrostis rubescens*	Douglas-fir - lodgepole pine - Sitka alder - pinegrass	ICHmk1/04	S3	Blue
Pseudotsuga menziesii / Symphoricarpos albus / Balsamorhiza sagittata	Douglas-fir / snowberry / balsamroot	IDFdm2/03	S2	Red
Purshia tridentata / Pseudoroegneria spicata	Antelope-brush / bluebunch wheatgrass	IDFdm2/02 PPdh2/00	S2	Red
Symphoricarpos occidentalis - Festuca idahoensis	Western snowberry - Idaho fescue	IDFdm2/00?	S2?	Red
Thuja - Paxistima - Lonicera utahensis	Western redcedar/hybrid white spruce - falsebox	ICHmk1/01	S3	Blue

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Changes from the 2000 list include the results of the most recent ranking review of natural plant communities. Additions to the Red and Blue list include some natural plant communities previously considered secure and now recognized as vulnerable, as well as rare plant communities recently described from new

inventory data. Successional and Structural stages for each plant community are currently under review and have been removed from the list until the next update.

Biogeoclimatic Site Unit(s): This column indicates the BGC unit(s) in which each plant community is known to occur (future inventories may indicate range extensions). The two digit number following the slash (01 and up) indicates that the community is part of the B.C. Ministry of Forests (MOF) site series classification. Information on the site series classification can be found in the MOF Field Guides for Site Identification (http://www.for.gov.bc.ca/research/becweb). A two digit number of '00' indicates that the community is not part of the MOF site series classification but is a recognized community from other vegetation and site classifications, and ecosystem mapping projects). The original source information for these communities can be obtained by contacting the CDC directly (contact info above).