

# **Southern Rocky Mountains Management Plan – Public Review Draft**

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## **Environmental Risk Assessment**

Prepared for  
Ministry of Sustainable Resource Management  
Resource Management Division  
Cranbrook, B.C.

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June 18, 2003



## EXECUTIVE SUMMARY

### Summary of environmental implications related to the implementation of the Southern Rocky Mountains Management Plan (SRMMP)- Public Review Draft.

Environmental Account	SRMMP
<p><b>Coarse Filter Biodiversity</b></p> <p><i>Seral Stage Distribution</i> (Mature and Old Growth)</p> <p><i>Ecosystem Representation</i></p> <p><i>Connectivity</i></p> <p><i>Wildlife Tree Retention</i></p> <p><i>Riparian</i></p>	<ul style="list-style-type: none"> <li>• A total of 36,884 ha of <i>Old Growth Management Areas</i> (OGMAs) spatially deployed. Proposed OGMAs capture target biogeoclimatic subzone variant representation for 10 LU/BEC combinations. Reduced risks to forest stand attributes and wildlife species dependent on mature and old forest.</li> <li>• Similar to the Base Case, however, 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 forests are recruited within OGMAs (e.g., MSdk and ICHmk1). Over the longer term, higher risk levels may become apparent in landscape units where meeting mature seral targets are not required.</li> <li>• Overall, some mature and old forests will remain in inoperable areas as well as the Timber Harvesting Land Base (THLB) to meet OGMA and VQO objectives as well as other FPC requirements (e.g., <i>Riparian Reserve Zones</i>, <i>Wildlife Tree Patches</i>). Although there will be fewer large areas of mature and old forest present in low and mid-elevation forests as harvesting proceeds, proposed zones such as the <i>Enhanced Riparian Zone</i> (7,206 ha) along the Flathead River suggests reduced risks to fish and wildlife species dependent on this regionally significant floodplain.</li> <li>• Proposed <i>Connectivity Matrix</i> (174, 750 ha), which is composed largely of inoperable forest (41%) has the potential to maintain a degree of landscape connectivity; however its effectiveness to promote species dispersal remains uncertain.</li> <li>• Overall, the large amount of private land surrounding the core SRMMP area poses significant challenges to maintaining regional connectivity. As such the risks to species dependent on connectivity remains high in the Elk Valley with somewhat lower risks (moderate) in the remaining plan area.</li> </ul> <p><b>Overall Risk: Moderate-High</b></p>
<p><b>Fine Filter Biodiversity</b></p> <p><i>Ungulate Winter Range</i></p>	<ul style="list-style-type: none"> <li>• New ungulate winter range (UWR) mapping identifies a total gross area of 271,358 ha within the core SRMMP. Most of the ungulate winter range is represented by <i>Managed Forest wet</i> (77%) and <i>Managed Forest moist</i> (18%) with the majority of remaining area represented by <i>Open Forest</i>, and <i>shrub</i> habitat types.</li> <li>• About 40% of the forested area identified as UWR (76,487 ha) occurs on the timber harvesting land base (THLB), which indicates forest management activities need to be sensitive to ungulate winter range values, particularly as they relate to mature forest cover retention requirements and road access.</li> <li>• Overall, management objectives proposed by SRMMP to maintain ungulate winter range appear adequate, however,</li> </ul>

	<p>objectives would be strengthened by explicitly including mature cover requirements in objectives, especially for deer.</p> <ul style="list-style-type: none"> <li>• Proposed ecosystem-based approach to ungulate winter range is a departure from the traditional species-based model. Although this approach may be adequate to maintain ungulate species that have similar habitat requirements, the appropriateness of managing for a suite of species that have different habitat requirements (e.g., mule deer and moose) is questionable.</li> <li>• About 44% of ungulate winter range overlaps areas designated as non-motorized winter recreation access (RA1), which suggests reduced disturbance levels to wintering ungulates and lower risks compared to current management. The majority of remaining ungulate winter range (50%) occurs in the restricted motorized access areas (RA2). Although the exact locations and timing of these potential restrictions are not clear at this time, the potential for disturbance and hence risks are estimated to be slightly higher in these areas compared to RA1. Only a small percentage (6%) of total identified ungulate winter range is at high risk from potential snowmobile disturbance</li> <li>• The SRMMP further reduces the potential risks to ungulates associated with human disturbance and helicopters through Objective 8.1.1, which discourages helicopter-dependent commercial recreation tenures within the plan area (i.e, heli-skiing; heli-hiking). This will have the greatest impact on those mountain ungulates considered most susceptible to helicopter disturbance such as mountain goats.</li> <li>• Overall, the overlapping distribution of ungulate winter range and recreation access areas as well as the proposed management objectives suggests low to moderate risks to wintering ungulate populations. However, development of a comprehensive access management plan that incorporates industrial access strategies is required to meet the low risk benchmark. Continued monitoring of each ungulate species will be required to test the ecosystem-based mapping approach including proposed forage and cover requirements as well as habitat use and movement patterns within each recreation access zone.</li> <li>• Ungulate winter range on private land remains vulnerable to human and resource development activities (e.g., mining, agriculture, human settlement).</li> </ul> <p><b>Overall Risk: Low-Moderate</b></p>
Grizzly Bear	<ul style="list-style-type: none"> <li>• Residential development on crown land prohibited in high density grizzly bear watersheds (e.g., Flathead, Wigwam) indicates reduced mortality risk to grizzly bears.</li> <li>• 84% of high and medium density grizzly bear population areas (crown forested land base) allocated to <i>low intensity</i> Recreation Management Zone (RM1). Remaining area (16%) occurs in <i>moderate intensity</i> recreation development areas (RM2).</li> <li>• Total proportion of existing roads designated as non-motorized (&gt;75%) indicates increased habitat effectiveness and reduced mortality risks associated with bear-human conflicts.</li> <li>• Enhanced protection for critical foraging and security habitats including avalanche chute buffers as well as establishment of <i>Enhanced Riparian Zone</i> (7,206 ha) in Flathead Valley.</li> <li>• Overall, the relative risks to grizzly bears will vary throughout</li> </ul>

	<p>the plan area. Risks will remain high on private land, however, the Recreation Management Strategy and other management objectives suggest moderate to low risks over much of the plan area. However, in order to reduce mortality risk further (i.e low risk benchmark), a comprehensive access management plan that includes industrial access needs to be developed and implemented.</p> <p><b>Overall Risk: Moderate</b></p>
<i>Fish Habitat</i>	<ul style="list-style-type: none"> <li>• The SRMMP partly reduces the risks to fish and fish habitat. This is largely accomplished by potentially reducing angling pressure through the Recreation Management Strategy and providing increased riparian habitat protection (Enhanced Riparian Zone, Backcountry River Corridors). Although there are general measure of success identified, specific fish objectives are lacking</li> <li>• 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. However, proposed 30 m buffers on S5 and S6 streams licensed for human water consumption provide some enhanced protection. A lack of a complete inventory for bull trout (a blue-listed species) suggests bull trout populations remain at risk.</li> </ul> <p><b>Overall Risk: Moderate</b></p>
<p>Note: The management objectives developed by the SRMMP as well as any future industrial access management plans need to apply to a broader regional area that ideally encompasses the larger Resource Evaluation Area. Developing a management plan that considers a number of contiguous landscape units ensures conservation values are managed at an appropriate spatial scale and provides greater certainty that ecological processes will be maintained and plan objectives will be achieved (e.g., connectivity matrix, recreation management strategy, grizzly bear, ungulate winter range).</p>	

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## 1.0 Introduction

This environmental risk assessment summarizes the expected changes and relative risks to the environment (biodiversity, wildlife, and fish) that could occur through implementation of the Southern Rocky Mountains Management Plan (SRMMP) - Public Review Draft. The purpose of the assessment is to inform decision-makers, stakeholders and the general public about the expected changes and relative risks to the environment that may occur through implementation of the SRMMP. This document is meant to compliment the previous Base Case report, which assumed a continuance of current management practices and attempted to address qualitatively the trends for each environmental value in the absence of the SRMMP.

## 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).

### 2.1 The Kootenay Boundary Higher Level Plan Order

As stated in the Base Case Report (December 2002), in addition to other existing legislation and policies, the current management regime includes provisions identified in the Kootenay Boundary HLP Order (June 2002). Because the KBLUP was identified as Base Case management it is worth repeating the specific objectives and strategies identified in the most recent KBLUP Order in an effort to support certain conclusion reached.

Pursuant to Section 3(1), 3(2) and 9.1 of the FPC Act, the Kootenay-Boundary Higher Level Plan Order established Resource Management Zones and objectives. Specific objectives and strategies established as a Higher Level Plan (HLP) and relate to the SRMMP include:

<b>High Level Plan Order (June 14, 2002)</b>
<ol style="list-style-type: none"><li>1. Adopt Biodiversity Emphasis Options (BEOs) as per (Objective 9.2.1. SRMMP).</li><li>2. Retain mature and old forest retention targets (as per LUPG).<ol style="list-style-type: none"><li>2.1</li><li>2.2</li><li>2.3 generally be designed to achieve targets in the shortest time frame</li></ol></li><li>3. Caribou (does not apply to Cranbrook RMZ and SRMMP)</li><li>4. 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.</li><li>5. Retain adequate amounts of mature and/or old forests adjacent to important avalanche tracks to</li></ol>

maintain grizzly bear habitat

5.1 Maintain mature and/or old forests within identified regional connectivity corridors.

6. 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.
7. Establish specific areas as Enhanced Resource Development Zones – Timber
8. Restore and maintain the ecological integrity of fire-maintained ecosystems
9. Establish high quality viewscales as known scenic areas
10. Maintain social and economic stability

## 2.2 Key Environmental Accounts

Environmental accounts and indicators used in 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:

- Seral Stage Distribution (Mature and Old Growth) - coarse filter
- Connectivity Matrix - coarse filter
- Ungulate Winter Range - fine filter
- Grizzly Bear - fine filter

The MSRM provided the most recent inventory information for the environmental indicators/accounts used in this report. Because the SRMMP boundaries<sup>1</sup> as well as many of the mapping initiatives including grizzly bear, connectivity and ungulate winter range have changed since the Base Case Report, direct comparison of the SRMMP and Base Case area statistics were not possible. Nonetheless, similar to the Base Case, the focus of this assessment was to compare the SRMMP to a well-defined low risk benchmark for each environmental account (see below).

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 areas potentially available for forest harvesting (THLB), as well as non-THLB areas (collectively referred to as crown forested land base CFLB). In addition, because the *Recreation Management Strategy* (RMS) represents the dominant land management direction in the SRMMP, the total area (ha) occurring in each RMS zone or category was calculated for key coarse filter and fine filter biodiversity components including the connectivity matrix, high density grizzly bear areas and ungulate winter range. Similarly, the composition of the connectivity matrix and total areas of proposed Old Growth Management Areas (OGMAs) proposed were determined.

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<sup>1</sup> The Base Case Report area statistics were calculated using the larger Resource Evaluation Area

## 2.3 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 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.**

<ul style="list-style-type: none"> <li>• <i>The more closely managed forests resemble natural disturbance regimes<sup>2</sup> (i.e., maintain forest composition and stand structures), the greater the probability that populations of all native species will be maintained.</i></li> <li>• <i>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.</i></li> <li>• <i>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.</i></li> <li>• <i>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.</i></li> <li>• <i>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.</i></li> </ul>
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### 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

<sup>2</sup> “natural” disturbance regime refers to disturbance events pre-European contact.



availability under alternative land use scenarios. These alternative land use scenarios could then be ranked according to their relative risk to population viability. Similar to the Base Case Report, the data necessary to use these decision tools, however, were not available for this assessment.

Moreover, the data necessary to develop specific targets and thresholds related to coarse filter and fine filter habitat supply models remain limited, which poses challenges to risk assessment methods. 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 management direction under the SRMMP.

## 2.4 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 seral stage distribution and corresponding deviations 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 inferring potential risks by considering stand 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.

Second, because the SRMMP plan focuses on the *Recreation Management Strategy*, how much habitat allocated to each Recreation Management Zone (i.e., motorized, non-motorized) was calculated. A brief summary of the RMS categories is provided below:

The SRMMP developed Recreation Management Zones focusing on the intensity of allowable recreation development. Specifically, the Plan identifies four categories including:

- RM1:** areas where the lowest levels of recreational infrastructure and use should occur.
- RM2:** areas where the low to moderate levels of recreational infrastructure and use should occur.
- RM3:** areas where the moderate to high levels of recreational infrastructure and use should occur.
- RM4:** areas where moderate to high levels of recreational infrastructure and use currently exist. No new structures permitted.

In general, these broad categories apply to whole landscape units; however, in certain instances two categories are identified within one landscape unit to meet specific objectives (e.g., LU23, LU24, LU26, LU27).

Within each of these broad Recreation Management Zones, the SRMMP identified specific ground-based recreation management objectives including:

- RA1:** areas or corridors available for non-motorized recreation
- RA2:** areas or corridors available for motorized recreation with specific limitations for timing and/or location
- RA2.1:** areas or corridors available for snowmobile use only
- RA2.2:** areas or corridors open for snowmobile use after a specific date
- RA3:** areas or corridors available for motorized and non-motorized recreation

Although the SRMMP also identified aerial-based recreation access zones (RH1, RH2 and RH3), the spatial locations of RH categories have yet to be defined, so were not included in the analysis. Relative risk levels associated with each RMS category are discussed under each fine-filter account.

The next step included an evaluation of the proposed management practices for each environmental value. The primary consideration or question asked here was “Are the objectives and best management practices proposed by the SRMMP 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.<sup>3</sup> 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

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 indicated by the Biodiversity Emphasis Option. It should also be recognized that these risk levels do not explicitly incorporate other risk factors such as increased or decreased road access. As mentioned above, the implications of access management as they relate to the RMS are discussed under each account.

<sup>3</sup> 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).

### 3.0 Seral Stage Distribution (Mature and Old Growth)

**Assessment Indicators:** Deviation from natural seral stage distribution (using BEO as surrogate)

**Assumptions:** See Table 2 (above).

**Low Risk Benchmark:**

- Natural Levels of Disturbance –
- Within managed landscapes, High BEO preferred option in all Landscape Units/BEC combinations (i.e., >75% natural levels of mature and old forest).
- Old Growth Management Areas representative of biogeoclimatic subzone/variants and site series within each landscape unit. OGMA capture high value wildlife habitats and rare ecosystems. OGMA patch sizes should be within the range of natural variability including those large enough to provide forest interior conditions.

The SRMMP proposes a total of 36,844 ha in Old Growth Management Areas (OGMAs) distributed across 10 Landscape Units (Table 1). As directed by the KBLUP Higher Level Plan Order, the majority (~80%) of the total crown forested land base (CFLB) within the SRMMP area will be managed to meet Intermediate biodiversity age class objectives with the remaining forested area managed to meet High BEO age class objectives. Because the SRMMP proposes the same Biodiversity Emphasis Options (BEO) as stated in the KBLUP Higher Level Plan Order, there is no direct (positive or negative) environmental impact associated with SRMMP management direction compared to current management. However, the SRMMP has spatially identified locations of Mature Seral Management Areas (MSMAs) and OGMA within the plan area, which provides greater immediate certainty that specific areas will be managed to sustain mature and old growth attributes.

The proposed OGMA were spatially deployed using the methods and required targets for each LU/BEC combination as set out in the LUPG. Tree species and age class were the dominant stand criteria used to locate OGMA, focusing on late seral spruce and Douglas-fir stands<sup>4</sup>. Although this assessment was unable to evaluate specific old growth attributes captured in the OGMA<sup>5</sup>, the composition of the OGMA are representative of the available forest at the variant level (Fig. 1). However, because there are relatively few mature or old forests currently present in the MSdk and ICHmk1 (Base Case Report 2002), many Landscape Unit/BEC combinations required recruitment of younger forests to meet targets. This also occurred in ESSF forests, however, to a lesser extent, which reflected the greater amounts of mature and old forest present in the ESSF non-contributing areas.

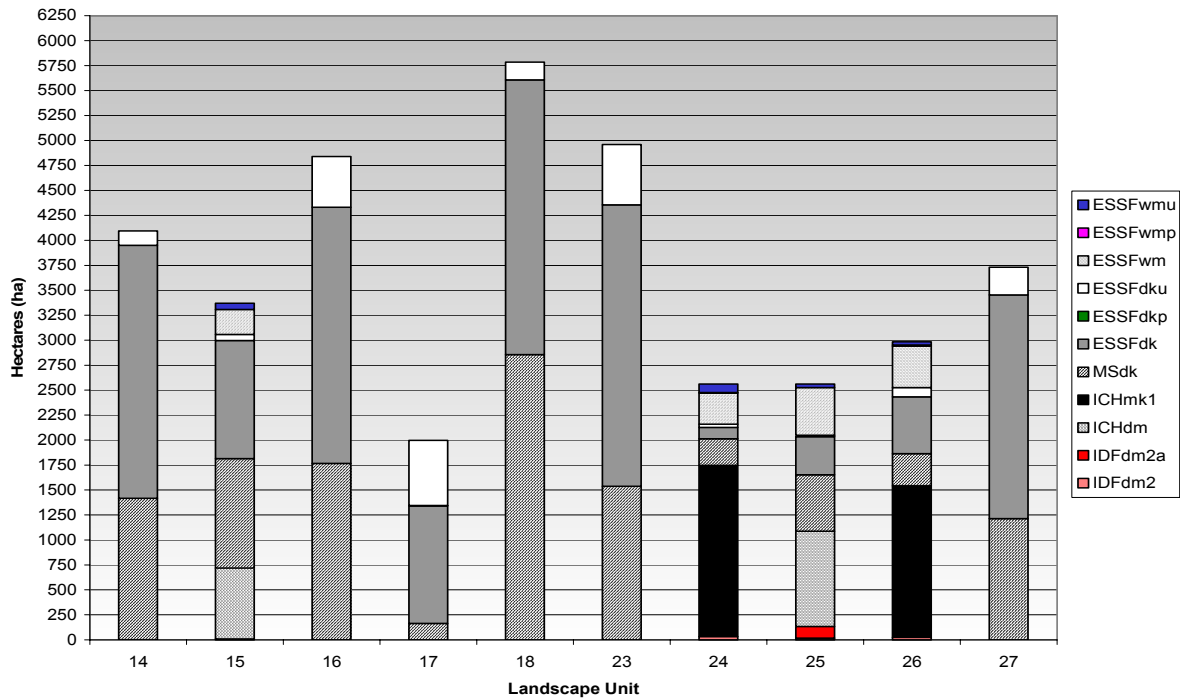
Similar to the Base Case, the relatively large amount of Intermediate BEO assigned to most Landscape Unit/BEC combinations suggests “moderate to high” risk levels for coarse filter biodiversity elements (assuming 50% of natural quantities of mature and old forest are retained). In the short term, higher 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 forests are recruited within OGMA. Over the longer term, higher risk levels may become apparent in landscape units where meeting mature seral targets are not required.

<sup>4</sup> Darcy Monchak – Forest Planner MSRM (pers.comm)

<sup>5</sup> The Automated Effectiveness Indicators Tool in DART could provide more specific comparisons of the proposed OGMA relative to the available forest in each Landscape Unit.

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.

Although road development and timber harvesting are allowed in proposed OGMAs, the SRMMP states that road development is discouraged and requires sign-off by a Registered Professional Biologist (R.P.Bio). This provides a mechanism of agency referral and provides some assurance that OGMAs will not be compromised. Furthermore, the SRMMP states that within Mature Seral Management Areas (MSMAs) timber harvesting prescriptions must maintain 70% of the pre-harvest basal area in any given stand. In particular, there is no facility development allowed in the OGMAs or MSMAs. Although mineral exploration and development activities are exempted from meeting this objective, there are no planned activities in the proposed OGMAs. Overall, this suggests risks are low in the short-term, but risk to old growth attributes may increase over time as potential mineral explorations and development occur.



**Figure 1. Ecosystem Representation (biogeoclimatic subzone/variant) of proposed OGMAs within the SRMMP. Within each Landscape Unit, total hectares and relative proportions of each biogeoclimatic subzone/variant represent targets defined by LUPG and HLPO.**

**Table 1. Total area (ha) of Crown Forested Land base (CFLB) proposed as Old Growth Management Areas (OGMAs) by landscape unit and biogeoclimatic subzone - SRMMP**

Landscape Unit No.	ESSFdk	ESSFdkp	ESSFdku	ESSFwm	ESSFwmp	ESSFwmu	ICHdm	ICHmk1	IDFdm2	IDFdm2a	MSdk	Grand Total
14	2,534		144								1,417	4,095
15	1,184		61	249		62		709	10		1,095	3,370
16	2,566	1	507								1,766	4,840
17	1,176	3	654								165	1,999
18	2,751		178								2,856	5,785
23	2,820		602								1,536	4,959
24	114		32	312	5	86		1,714	33		267	2,562
25	381		15	476		35	953		17	117	567	2,561
26	567		92	416	12	31		1,518	24		324	2,984
27	2,240		277								1,214	3,731
<b>Total Area (ha)</b>	<b>16,333</b>	<b>4</b>	<b>2,564</b>	<b>1,454</b>	<b>16</b>	<b>214</b>	<b>953</b>	<b>3,941</b>	<b>84</b>	<b>117</b>	<b>11,205</b>	<b>36,884</b>

## 4.0 Wildlife Tree Retention

Assessment Indicator (s)	Assumptions
1) wildlife tree retention targets as defined by LUPG or SRMMP 2) proposed resource management zones and strategies (e.g., OGMA, riparian zones)	<ul style="list-style-type: none"> <li>• Although specific wildlife tree retention levels will vary by wildlife tree user requirements, natural levels of dead trees are assumed to provide the least (low) risk (i.e., 10-60 stems/ha; from Steeger 2002).</li> </ul> See Table 2 for other assumptions related to wildlife trees
<b>Low Risk Benchmark:</b> natural levels of wildlife tree densities (stems/ha) including a range of tree species, sizes and decay classes representative of the pre-harvest stand composition ( <i>Provincial Wildlife Tree Policy and Management Recommendations</i> ).	

The Base Case Report suggested the supply of potential cavity nesting trees is declining and those species dependent on high value wildlife trees remain vulnerable under current management practices. The SRMMP essentially adopts current management policies with respect to wildlife tree retention levels, suggesting no incremental impact compared to the Base Case. However, the establishment of spatially defined OGMA as well as the proposed Enhanced Riparian Zone along the Flathead River will contribute to increased habitat protection and partly reduce the risk to species dependent on wildlife trees.

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 OGMA 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*. Overall, the risks are estimated to be moderate.

## 5.0 Riparian Ecosystems

The SRMMP reduces the risks to riparian values in the southeast corner of the plan area by establishing an Enhanced Riparian Zone along the mainstem of the Flathead River. The total area captured within the Flathead Enhanced Riparian Zone (7,206 ha) combined with the approach used to define its boundaries (i.e., natural floodplain features) suggests riparian vegetation and hydrological processes will be maintained closer to natural levels. The proposed management strategies also provide increased protection by prohibiting new road construction, which suggests reduced disturbance to fish and wildlife that depend on this regionally significant floodplain. Similarly, because the SRMMP also proposes to replace backcountry river corridors with Enhanced Riparian Zones further suggests reduced risks to riparian values along other major rivers and streams.

In addition, the SRMPP proposes a 30 m *Riparian Management Zone* along S5 and S6 streams used for consumptive uses, which also reduces the risks to these riparian areas by maintaining more natural levels of vegetation. It should be noted, however, that this management objective was identified as a HLP Order and therefore not considered incremental compared to the Base Case.

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. Similar to current management practices, 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). Overall, the relative risk to riparian ecosystems is estimated to be low moderate within Enhanced Riparian Zones and moderate over the remaining planning area.

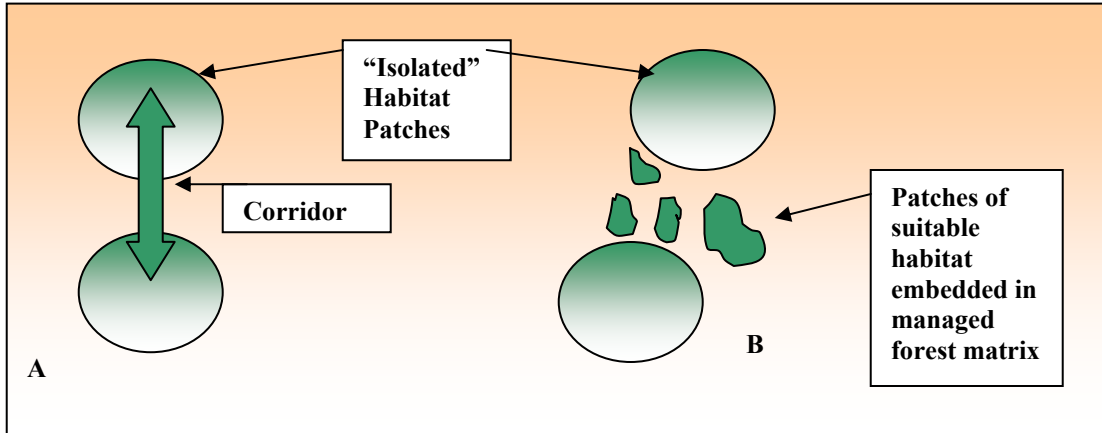
## 6.0 Connectivity

Assessment Indicator (s)	Assumptions
1) Composition of connectivity matrix  2) Percent of connectivity matrix in each Recreation Management Zone	<ul style="list-style-type: none"> <li>contiguous areas are better than disjointed areas (Noss <i>et al</i> 1997.)</li> <li>The level of habitat loss at which habitat fragmentation thresholds are reached is determined by the pattern of habitat distribution and the dispersal capabilities of the species (With and King 1997).</li> </ul>
<p><b>Low Risk Benchmark:</b> well-distributed areas of mature and old forest, preferably in large contiguous and wide patches; no large permanent fracture zones present (e.g., settlements, highways)</p> <p>Note: qualitatively assessed due to lack of specific information on connectivity patch sizes and species-specific thresholds to connectivity and fragmentation</p>	

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.

Although the original intent of the KBLUP was to manage regional connectivity using a *corridor*-based approach, the SRMMP developed a *connectivity matrix*-based approach to manage regional and landscape connectivity within the plan area. Briefly, the corridor-based approach attempts to connect isolated patches of high quality habitat by creating a contiguous corridor between habitat patches whereas the connectivity-matrix approach, promotes movement and species dispersal between high quality patches using a variety of suitable habitat types (Fig. 2).





**Figure 2. Schematic diagram illustrating two approaches used to maintain connectivity: (a) corridor-based approach and (b) matrix-based approach**

The GIS area summary indicated there are 174,750 ha of habitat contained within the connectivity matrix. The matrix is composed primarily of inoperable forest (41%) as well as ungulate winter range (27%) and OGMAs (21%) (Table 2). The remaining portions are made up of grizzly bear avalanche chutes as well as mature forest and riparian areas. Overall, the composition of the connectivity matrix indicates there are high quality habitat patches potentially present, however, the extent to which these areas will actually function to maintain connectivity is less clear. Although the inoperable areas as well as the riparian components of the matrix will remain largely intact, the ability for other components to contribute to the efficacy of the matrix is dependent on their specific management direction as well as broader resource management direction provided by each Biodiversity Emphasis Option and Recreation Management Zone. For example, the degree to which ungulate winter range can contribute to maintaining connectivity is dependent on the management objectives identified for each winter range habitat type (see below) and the degree of potential disturbance resulting from recreation development and activities. The GIS area statistics indicated most of the connectivity matrix occurs in *low intensity*<sup>6</sup> Recreation Management Zones (RM1) for summer-based activities; however, during winter, more of the matrix is allocated to the *moderate intensity* Recreation Management Zone (RM2), which suggests slightly higher risks to species during this season.

Similarly, OGMAs that are represented by existing mature and old forest will better contribute to connectivity objectives whereas OGMAs that were recruited (i.e., contain younger forests), may function somewhat less effectively over the short to medium term if they are perceived as barriers to movement by some species. The ability for the connectivity matrix to function ecologically (i.e., provide a means for species dispersal, successful reproduction and persistence) is also partly dependent on the relative suitability of the areas between “suitable patches” (i.e., the surrounding matrix of lands). The fact that approximately 47,595 hectares of connectivity habitat occurs on the THLB (27%), and at potential risk from forest harvesting activities and further road development suggests the management regimes on these lands will partly affect the extent to which the connectivity matrix can function.

It should be emphasized that maintaining and measuring effective connectivity is difficult because it depends not only on the degree of habitat fragmentation but also the habitat affinities of the species and their ability to move across a landscape and effectively utilize spatially distributed resources (e.g., food, mates).

<sup>6</sup> Intensity levels of Recreation Management Zones have not been quantitatively defined

Whether the connectivity matrix approach is better than the corridor-based approach remains unknown. Further research will be required to assess the efficacy of the connectivity matrix to individual species. 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.

**Table 2. Composition of Landscape Connectivity Matrix and relative occurrence of each component in each Seasonal Recreation Management Zone -SRMMP**

Connectivity Matrix Component	Winter Recreation Management Zone			Summer Recreation Management Zone			Percent of Total (%)
	RM1	RM2	Total (ha)	RM1	RM2	Total	
Old and Mature forests adjacent to Grizzly Bear Avalanche Chutes	410	1,897	2,307	634	1,673	2,307	1.3
Backcountry River Corridor	2,536	5,128	7,663	3,284	4,379	7,663	4.5
Inoperable CFLB	26,973	43,612	70,585	51,314	19,271	70,585	41.2
Mature	5,278	1,656	6,934	6,934		6,934	4.0
OGMAs	16,233	20,651	36,885	28,332	8,854	36,885	21.1
Riparian	2,080	2,299	4,379	4,379		4,379	2.6
Ungulate Winter Range	18,429	27,568	45,997	34,202	11,795	45,997	26.8
<b>Total (ha)</b>	<b>71,939</b>	<b>102,811</b>	<b>174,750</b>	<b>128,777</b>	<b>45,972</b>	<b>174,750</b>	<b>100</b>

Numbers represent total Crown Forested Land Base: RM1 = Low Intensity Recreation Development; RM2 = Low to Moderate Intensity Recreation Development; OGMA = Old Growth Management Area

## 7.0 Ungulate Winter Range

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 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).

Assessment Indicator (s)	Assumptions
<ul style="list-style-type: none"> <li>• Percent of Ungulate Winter Range (UWR) that occurs on the timber harvesting land base (THLB)</li> <li>• Percent of Ungulate Winter Range in each Winter Recreation Management Zone</li> <li>• Management Objectives and Strategies proposed for each UWR Habitat Type</li> </ul>	<ul style="list-style-type: none"> <li>• Mature forest cover and open foraging habitats available throughout a rotation and be appropriately distributed (spatial/temporal) within a landscape unit for long-term population viability.</li> <li>• Commercial and public recreation activities (e.g., heli-skiing, snowmobiling, hiking), as well as forestry, mining and range use practices can increase risks to ungulate populations through disturbance, habitat displacement and increased road access (Bleich <i>et al.</i> 1994, Morrison <i>et al.</i> 1995, Cole <i>et al.</i> 1997, Côté 1996, Papouchis <i>et al.</i> 2001). However, degree of impacts will vary with frequency and duration of human activity.</li> <li>• Increased road development can increase hunter success and reduce ungulate densities (Rempel <i>et al.</i> 1997). However, access management strategies (e.g., access control points) or seasonal closures considered to partly reduce risks (Cole <i>et al.</i> 1997).</li> </ul>
<p><b>Low Risk Benchmark:</b></p> <ul style="list-style-type: none"> <li>• Habitat supply maintained over time. Specifically, winter range attributes (snow interception cover and forage supply) meet individual species requirements at both landscape and stand-level spatial scales within the range of natural variability for a given BEC/NDT and snowpack zone.</li> <li>• Access Management Areas identified with effective access control measures implemented. Threshold values of &lt;1 km/km<sup>2</sup> open road density preferred.</li> </ul>	

The East Kootenays (MSRM, WLAP) have developed new ungulate winter range mapping using an ecosystem-based approach (i.e., as opposed to a species-based approach). Nine broad habitat types have been identified (See Table 3), which correspond to various biogeoclimatic subzones and individual site series or ecosystem units. Each if these ecosystem units were identified using *Predictive Ecosystem Mapping* (PEM) and their relative habitat suitability and capability determined for priority species.

About 271,358 ha of new ungulate winter range mapping has been identified in the SRMMP. Most of the ungulate winter range is represented by *Managed Forest wet* (77%) and *Managed Forest moist* (18%) with the majority of remaining area represented by *Open Forest*, and *shrub* habitat types (Table 3). Because the majority of ungulate winter range identified is wet and moist managed forest, most of the management including landscape level objectives focuses on maintaining moose winter range. The SRMMP proposes to manage these habitat types by maintaining at least 30% mature cover and 10% forage at the landscape level. Overall, these objectives appear adequate to maintain moose habitat considering the climate and snow accumulations typical of these subzones (ICH, ESSF). However, because the focus of the management objectives for both wet and moist managed forest is to maintain early seral vegetation, the objective would be strengthened by recognizing that mature forest cover may become limiting during deep snowpack winters (i.e., the objective should state “maintain early seral and mature forest cover through time” – this is more of an issue for deer than for elk). This is not only important in context of designating management objectives as Higher Level Plan Objectives, but also how ungulate winter ranges are distributed across the plan area. Specifically, about 189,832 ha of ungulate winter range occurs on the crown forested land base. Of that,

76,487 ha (40%) occur on the timber harvesting land base (THLB). This relatively large percentage suggests forest management activities need to be sensitive to ungulate winter range values, particularly as they relate to mature forest cover retention requirements and road access. It is also worth noting that ungulate winter range that occurs on private land also remains vulnerable to human and resource development activities (e.g., mining, agriculture, human settlement).

The GIS area analysis indicated that about 44% of ungulate winter range overlaps areas designated as non-motorized winter recreation access (RA1), which suggests reduced disturbance levels to wintering ungulates and lower risks compared to current management. The majority of remaining ungulate winter range (50%) occurs in the restricted motorized access areas (RA2). Although the exact locations and timing of these potential restrictions are not clear at this time, the potential for disturbance and hence risks are estimated to be slightly higher in these areas compared to RA1. Only a small percentage (6%) of total identified ungulate winter range is at high risk from potential snowmobile disturbance (Table 3).

**Table 3. Area (ha) summary of ungulate winter range habitat types and their relative occurrence by winter recreation access zones - SRMMP**

Habitat Type	RA1	RA2	RA2.1	RA2.2	Total (ha)	% of total
Managed Forest dry	77	203		63	344	0.1
Managed Forest mesic	850	76	78	0	1,004	0.4
Managed Forest moist	37,046	9,495	868	303	47,712	17.6
Managed Forest transition	156	2			158	0.1
Managed Forest wet	73,991	120,448	4,548	10,301	209,288	77.1
Open forest	3,422	3,611	150	67	7,251	2.7
Open range	571	507	7	34	1,119	0.4
Shrub	2,765	1,549	150	19	4,483	1.7
Total area (ha)	118,878	135,891	5,802	10,787	271,358	100.0
(% of total)	(43.8%)	(50.1%)	(2.1%)	(4.0%)	(100%)	

\* hectares represent total gross area within core SRMMP (i.e., all forested and non-forested lands). Private, parks and federal lands not included. RA1 = non-motorized; RA2 = restricted motorized; RA2.1 = snowmobile use only; RA2.2 = snowmobile use after specified date (March xx). Winter Season (Dec.15-April 14).

In addition to the implications related to the four ground-based winter recreation access zones, other proposed management objectives need to be considered. Specifically, the SRMMP further reduces the potential risks associated with human disturbance and helicopters through Objective 8.1.1, which discourages helicopter-dependent commercial recreation tenures within the plan area (i.e, heli-skiing; heli-hiking). This will have the greatest impact on those mountain ungulates considered most susceptible to helicopter disturbance such as mountain goats. Similarly, the expansion of existing or new recreation or tourism facilities is not permitted in the East and West Flathead as well as the Wigwam and West Elk Landscape Units.

Overall, the overlapping distribution of ungulate winter range and recreation access areas as well as the proposed management objectives suggests low to moderate risks to wintering ungulate populations. However, development of a comprehensive access management plan that incorporates industrial access strategies is required to meet the low risk benchmark. Continued monitoring of each ungulate species will be required to test the ecosystem-based mapping approach including proposed forage and cover requirements as well as habitat use and movement patterns within each recreation access zone.

## 8.0 Grizzly Bear

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<sup>7</sup>. 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.

Assessment Indicators	Assumptions
<ol style="list-style-type: none"> <li>1) Percent of Core Security Areas (high and medium density grizzly bear populations) that occur on the timber harvesting land base (THLB)</li> <li>2) Percent of Core Security Areas (high and medium density grizzly bear populations) in each Recreation Management Zone (intensity of development)</li> <li>3) Total km of road designated as non-motorized (RA1), restricted (RA2) and motorized (RA3) by landscape unit</li> </ol>	<ul style="list-style-type: none"> <li>• Increased motorized access and human settlement in areas with grizzly bear habitat generally results in increased mortality from human–bear interactions (McLellan 1990). Therefore, non-motorized areas (RA1) assumed to provide relatively low mortality risk and habitat displacement to grizzly bears. Overall, probability of grizzly bear survival declines as traffic levels, road densities and human settlement increases (Mace <i>et al.</i> 1996). Open roads can negatively affect grizzly bears through habitat displacement (McLellan and Shackleton 1988). However, the degree of risk to bears varies with type of road, proximity of road types (open vs closed), frequency of use by humans, and apparently sex of bear (Mace <i>et al.</i> 1996; see Wielgus <i>et al.</i> 2002).</li> <li>• Partially accessible areas (RA2) provide moderate risks (i.e., access control points assumed to partly reduce risk)</li> <li>• Fully accessible areas provide high risk (RA3).</li> <li>• Intermediate and High Biodiversity Emphasis Options preferred options for managing landscape level forage supplies (i.e., Low BEO assumed incompatible over long term due to imbalance in seral stage distributions and increased road network).</li> </ul>
<p><b>Low Risk Benchmark:</b></p> <ul style="list-style-type: none"> <li>•</li> <li>• designed to reduce mortality risk and habitat displacement</li> <li>•</li> <li>•</li> <li>• (within range of natural variability for each BEC/NDT ~ Intermediate-High BEO preferred).</li> <li>• Alternatively, habitat attributes managed in a way that limits disturbance and impacts (e.g., selection harvesting).</li> </ul>	

<sup>7</sup> A threshold of 50% of minimum habitat capability arbitrarily defines “threatened” (<50%) and “viable” (>50%) (WLAP)

A total of 245,205 ha of land have been identified as supporting high to medium densities of grizzly bears in the core SRMMP area. These areas are concentrated in the East (LU16) and West Flathead (LU18), West Elk (LU23) as well as portions of the Wigwam (LU14), Lodgepole-Bighorn (LU15), Sand (LU25), Iron-Sulphur Landscape Units, and Lower Elk (LU24)<sup>8</sup> (Table 4). Of this gross area, a total of 65,545 ha are comprised of crown forested land.

**Table 4. Area summary (ha) of high and medium density of grizzly bears by Landscape Unit**

Landscape Unit No.	Crown Forested Land Base			Gross Area		
	High density	Medium Density	Total CFLB Area (ha)	High density	Medium Density	Total Gross Area (ha)
14	83		83	15,897		15,897
15	7,122	1,945	9,067	13,838	6,248	20,086
16	3,673	4,932	8,605	28,747	20,955	49,702
17		1,581	1,581		3,390	3,390
18	7072	513	7,585	60,795	6,854	67,649
23	21,247		21,247	46,307		46,307
24	3,548		3,548	13,060		13,060
25	6,530		6,530	12,879		12,879
26	6,650		6,650	13,669		13,669
27	649		649	2,565		2,565
<b>Total hectares (ha)</b>	<b>56,575</b>	<b>8,970</b>	<b>65,545</b>	<b>207,758</b>	<b>37,447</b>	<b>245,205</b>

\* CFLB =crown forested land base only; Gross Area (ha) = all forested and non-forested lands within all land jurisdictions (i.e. provincial, federal, private, parks)

In addition, the SRMMP has identified a total of 17,243 ha of high and moderate value avalanche chute habitat<sup>9</sup> to meet Higher Level Plan Order objectives, which stated to maintain mature and/or old forest adjacent to avalanche chutes important to grizzly bears (Objective # 5). A total of 2,243 ha of mature and old forest adjacent to avalanche chutes were identified in the core SRMMP area, of which only 243 ha was considered operable (MSRM database).

As discussed in the Base Case Report, many of the concerns and issues related to maintaining viable grizzly bear populations are related to road access and bear-human conflicts in addition to maintaining adequate foraging habitat over time. The SRMMP addresses many of these concerns, especially those associated with the impacts of open roads through the development of the Recreation Management Strategy. In particular, the GIS area analysis indicated that 84% (54,818 ha) of high and medium density grizzly bear areas (crown forested land base) are designated as *low intensity* Recreation Development (RM1), which suggests reduced bear-human conflicts and potential mortality risk over the short and long term (Table 5).

<sup>8</sup> Other high density grizzly bear areas occur outside the SRMMP in the larger Resource Evaluation Area including the Upper Elk landscape units and portions of C20.

<sup>9</sup> Most of the avalanche chute and adjacent mature and old buffers are within the high density areas; however, the total hectares of avalanche chute habitat do include areas in C27 outside the SRMMP.

**Table 5. Area (ha) summary of high and medium density grizzly bear areas in Low and Moderate Intensity Recreation Development Zones – SRMMP**

Grizzly Bear Density	Low Intensity (RM1) Area (ha)	Moderate Intensity (RM2) Area (ha)	Total Area (ha) CFLB
High (1)	45,848	10,727	56,575
Medium (2)	8,970	0	8,970
Total Area (ha)	54,818	10,727	65,545
(% Of total)	(84%)	(16%)	(100%)

\* hectares represent crown forested land base only.

Although *low intensity* RM1 still needs to be quantitatively defined, the SRMMP prohibits the expansion of existing or new recreation or tourism-related facilities in key grizzly bear watersheds including the Flathead, Wigwam and West Elk, which eliminates the potential increased mortality risk associated with potential future recreation development activities.

Consistent with the allocation of high value grizzly bear watersheds to *low intensity* Recreation Development Zones, the SRMMP also increases the relative habitat effectiveness of high value grizzly bear areas by designating a large proportion of existing roads as non-motorized summer recreation access. Although the proportion of existing road kilometers designated as non-motorized varies by landscape unit (50-100%), the proportion is >75% in most areas, with higher proportions in key landscape units such as the East (LU18) and West Flathead (LU16) (~85%). It should be understood that roads are of variable condition and status, including many that are not passable with wheeled motorized vehicles, so that in some cases the SRMMP may be formalizing de facto motorized access closures.

Although the main Forest Service Roads will remain open and continue to receive both industrial as well as motorized recreational use, the large proportion of roads designated as non-motorized suggests a potential reduction in bear-human conflicts and reduced risks to bears. However, the ability for the recreation access management zones to function effectively will largely depend on the degree of compliance and enforcement. As such, the intent and objectives of the Recreation Management Zones are viewed as positive measures that may result in reduced bear-human conflicts; however, the actual extent to which they affect grizzly bear survival needs to be determined over time through monitoring initiatives.

In addition to public and commercial recreation related conflicts, resource development activities including new road development can also affect grizzly bears and their habitats. For example, about 20,187 ha (31% of crown-forested land base) of high density grizzly bear areas occur on the timber harvesting land base and are at potential risk from forest development activities and road access. These activities have the potential to affect grizzly bear habitat use both directly and indirectly by altering seral stage distributions of forested areas and reducing habitat effectiveness through increased road development. The SRMMP partly addresses these issues by providing enhanced protection for preferred foraging areas such as avalanche chutes and riparian areas. Specifically the SRMMP prohibits new road development in the Flathead Enhanced Riparian Zone and by designates a 50-100 m buffer along mapped avalanche chutes. The SRMMP also recommends that resource development activities in close proximity to avalanche chutes be avoided during May and June to minimize potential disturbance to bears. These measures suggest reduced disturbance to bears and maintenance of stand attributes closer to natural levels all of which indicate reduced habitat displacement and increased habitat effectiveness.

Overall, the relative risks to grizzly bears will vary throughout the plan area. Risks will remain high on private land, but moderate to low over much of the plan area. In order to reduce mortality risk further (i.e low risk benchmark), a comprehensive access management plan that includes industrial access needs to be developed and implemented. Furthermore, the management

objectives developed by the SRMMP as well as any future industrial access management plans need to apply to a larger regional area that encompasses the larger Resource Evaluation Area. Developing a management plan that considers a number of contiguous landscape units ensures conservation values are managed at an appropriate spatial scale and provides greater certainty that ecological processes will be maintained and plan objectives (e.g., connectivity matrix) are going to be achieved.

## 9.0 Other Wildlife and Plant Species at Risk

The Base Case report indicated there are specific gaps in current management related to species at risk, especially the smaller red and blue-listed species. In particular the tailed frog, 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. In addition, the Base Case report suggested that although some wildlife species 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.

The SRMMP has explicitly addressed some of the management concerns related to specific species at risk (e.g., grizzly bear, bighorn sheep). Although specific details are lacking at this time, the SRMMP has likely reduced the risk to some rare plant communities and animal species (e.g., tailed frog) through designation of Old Growth Management Areas and Enhanced Riparian Zones.

## 10.0 Furbearers

As indicated in the Base Case Report 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 for marten. However, because areas excluded from timber harvesting may provide some suitable habitat, the extent to which marten populations could decline is not clear.

The SRMMP adopts the Biodiversity Emphasis Options as directed by the HLPO, which (as previously mentioned) is not considered incremental to current management. However, the development of the connectivity matrix as well as the spatial deployment of Mature Management Areas and Old Growth Management Areas suggests a slight decline in risk levels over portions of the plan area because these areas will be maintained in a more natural and potentially suitable habitat condition. It should be emphasized, however, a more comprehensive analysis focusing on OGMA attributes and size and forest interior condition would be required to fully assess the contribution of OGMA to furbearers.

## 11.0 Fisheries

Although the SRMMP identifies some general *measures of success* for fish (e.g., decreased fish mortality), there are no specific objectives or strategies developed for this resource. Nonetheless, the SRMMP partly reduces the risks to fish and fish habitat by potentially reducing angling pressure through the Recreation Management Strategy and providing increased riparian habitat protection (i.e., Enhanced Riparian Zone, Backcountry River Corridors).



## 12.0 Conclusions

The SRMMP has developed general objectives as well as ‘*measures of success*’ for key environmental values, which is consistent with emerging government policy direction (i.e., results-based Forest Practice Code). Overall, the management objectives and measures developed indicate a positive trend with respect to maintaining certain components of biodiversity (e.g., old growth) and addressing key issues of concern, particularly those associated with public/commercial recreation and wildlife. However, many of the *measures of success* are general and lack either quantification and/or specific targets, which are required if implementation and effectiveness monitoring is to inform decision-makers. Although the intent of results-based management is to focus on the achievement of stated goals and objectives, it is difficult to assess the implications of land use plans that do not provide some level of prescriptive detail regarding how the objectives will be achieved. The development of comprehensive Best Management Practices for all conservation values similar to those provided for Watersheds (Appendix 5.2), would provide a level of increased certainty that proposed management objectives would be achieved. Without this clarity, there remains uncertainty with respect to the plans ability to meet stated objectives. Similarly, in order to meet some of the proposed objectives and intent of the plan, the boundary of the SRMMP needs to be expanded to the larger Resource Evaluation Area in order for the SRMMP to be fully effective in achieving desired outcomes. This is particularly important when applying the Recreation Management Strategy and meeting objectives defined for the connectivity matrix, ungulate winter range and grizzly bears. Although management direction as stated in the KBLUP Higher Level Plan Order will apply in areas outside the core SRMMP, the legal designation of the SRMMP or parts thereof (i.e., objectives) is unclear at this time, which creates additional uncertainty.

Lastly, the SRMMP proposes to adopt a Two-Zone approach for mineral resource management, which is consistent with recent provincial direction. Because one of the main objectives of the Two Zone/One window approach is to encourage investors and create greater land use certainty in the mining industry, there is the potential for increased mineral exploration and development activities to continue in surrounding areas as well as within the core SRMMP area. Although mineral exploration and development activities would be subject to standard regulatory review processes, risks to environmental values will increase beyond those estimated here, if there is an increase in exploration and development activities. Despite these concerns, risks may be partly reduced through mitigation and adhering to the best management practices proposed by the SRMMP.

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