

A Component of  
British Columbia's  
Land Use Strategy

# **Dawson Creek Land & Resource Management Plan**

## **Socio-Economic & Environmental Assessment**

### ***Final Report***

prepared by:

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**Dawson Creek LRMP Inter-agency Planning Team**

**February 1999**



**BRITISH  
COLUMBIA**



TO: Dawson Creek Land and Resource Management Plan (LRMP) Table  
FROM: Gord Enemark, Senior Analyst - Ministry of Employment & Investment  
RE: Socio-economic / Environmental Impact Assessment of Recommended Land Use Plan  
DATE: February 1999

Included herein is the finalized assessment of the identifiable socio-economic and environmental implications of the *Recommended Dawson Creek Land and Resource Management Plan* (June 1998). This analysis supersedes the *Dawson Creek LRMP Socioeconomic and Environmental Impact Assessment of Working Scenario: Draft Report* (March 1997) and the *Addendum to March 1997 Dawson Creek LRMP Impact Assessment* (August 15, 1997) done previously for the earlier "Working Scenario" version of the Land Use Plan. However, the final Land Use Plan has not changed considerably since 1997 and thus the key conclusions are very similar. In addition, where the June 1998 Plan was amended vs. the 1997 version, this document takes those changes into account and also attempts to address concerns raised by the Table subsequent to our presentation of the March 1997 assessment in Dawson Creek (Farmington).

Note that the assessment methodology is not "ad hoc" and strives to be consistent with the provincial government's *Social and Economic Impact Assessment for Land and Resource Management Guidelines in BC: Interim Guidelines, 1993*. As such, it should be emphasized that the purpose of this work is not to recommend any particular land use planning alternative, but to provide quantitative/qualitative accounting of the impacts and trade-offs of the LRMP vs. the "Base Case" (i.e., without LRMP) land use regime.

A summary assessment is included as "Appendix B" the June 1998 LRMP document, but note that particular summary actually pertained to the *Recommended Dawson Creek LRMP: Draft* (May 1998) and therefore many of the referenced page numbers in the text of that brief document do not correspond to the latest version (June 1998) of the LRMP document.

Contributing to the socio-economic work was Robinson Consulting & Associates and J. Paul & Associates, while Eliot Terry (R.P. Bio.) of Keystone Wildlife Research undertook all of the environmental analysis. Finally, as the primary author of the socio-economic portion of the report, it should be noted that while the assessment is done in cooperation with the Dawson Creek LRMP Inter-agency Planning Team, it is also meant to be an objective analysis done at "arms-length" from the local LRMP process.

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## TABLE OF CONTENTS

<i>Socioeconomic &amp; Environmental Assessment Summary Matrix.....</i>	<i>(i) - (iv)</i>
<b>1. Introduction &amp; Significance of the “Base Case” Land Use Regime.....</b>	<b>1</b>
<b>2. Forestry.....</b>	<b>3</b>
<b>3. Agriculture &amp; Range.....</b>	<b>10</b>
<b>4. Energy.....</b>	<b>12</b>
<b>5. Coal/Minerals.....</b>	<b>20</b>
<b>6. Tourism, Guide-Outfitting, &amp; Recreation.....</b>	<b>24</b>
<b>7. Trapping.....</b>	<b>31</b>
<b>8. Communities &amp; First Nations Implications.....</b>	<b>31</b>
<b>9. Environmental Assessment.....</b>	<b>33</b>
<b>9.1 Introduction</b>	
<b>9.2 Methods</b>	
<b>9.3 Overview of Plan Area</b>	
<b>9.4 Biodiversity</b>	
<b>9.5 Ecosystem Representation</b>	
<b>9.6 Old Growth</b>	
<b>9.7 Riparian Habitats</b>	
<b>9.8 Wildlife</b>	
<b>9.8.1 Warblers</b>	
<b>9.8.2 Marten</b>	
<b>9.8.3 Mountain Goat</b>	
<b>9.8.4 Mountain Sheep</b>	
<b>9.8.5 Elk</b>	
<b>9.8.6 Woodland Caribou</b>	
<b>9.8.7 Grizzly Bears</b>	
<b>9.9 Conclusions.....</b>	<b>47</b>

**APPENDIX I: Anticipated Biodiversity Options for Landscape Units**

**APPENDIX II: Coal Districts & Coalfields**

**APPENDIX III: Implications of Proposed Biodiversity Emphasis Options (1997)**





## SOCIO-ECONOMIC ASSESSMENT SUMMARY MATRIX

Resource Sector	"Pre-FPC" Timber Supply Review Management Regime & Trends	Base Case Management Regime & Trends (including TSR, AAC Rationale, FPC, PAS)	Implications of Proposed LRMP
<b>Summary of Regional &amp; First Nations Implications</b>	<ul style="list-style-type: none"> <li>Steady economic/population growth expected to continue, largely dominated by world market conditions for resources</li> <li>Future of NE Coal and deciduous timber supplies creating uncertainties</li> <li>First Nations nature-based values at risk due to resource development activities</li> </ul>	<ul style="list-style-type: none"> <li>Forest Practices Code (FPC) and Protected Areas Strategy (PAS) create some downward pressure on Crown timber supplies, especially deciduous</li> <li>Some First Nations values better protected</li> <li>Otherwise, similar to TSR regime</li> </ul>	<ul style="list-style-type: none"> <li>Somewhat slower economic growth than Base Case, but no losses in existing jobs</li> <li>Supportive of First Nations values (e.g., Twin Sisters SMZ) ; continuation of traditional activities in new PAs</li> <li>Otherwise, similar to Base Case</li> </ul>
<b>Forestry</b>	<ul style="list-style-type: none"> <li>Accounts for ~14% of Plan Area jobs</li> <li>Timber supply analysis indicates current harvest levels for TFL &amp; TSA conifer can be maintained indefinitely, but TSA deciduous (potential) harvest to fall by 21% to ~700,000 m3/yr over next 20 years and Long Term Harvest Level (LTHL) at 480,000 m3/yr after 30 yrs</li> <li>No job impacts can be identified from reduced TSA deciduous harvest, since only ~200,000 m3/yr now being harvested (i.e., timber under-utilized)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to TSR regime, except for some "forgone opportunities" for jobs from higher coniferous/deciduous harvests, e.g. FPC/PAS would cause TSA deciduous to decline by a further 17% to ~550,000 m3/yr over next 20 years and LTHL reduced to 440,000 m3/yr after 30 yrs</li> <li>Over long term, TSA deciduous LTHL reduced by 7% (33,000 m3/yr.) due to FPC &amp; 2% (7000 m3/yr.) due to new (Base Case) Protected Areas (PAs)</li> </ul>	<ul style="list-style-type: none"> <li>Still no identifiable impacts on existing jobs, but timber harvesting costs are likely to increase above FPC due to LRMP (e.g., access restrictions, wildlife strategies), assuming LRMP objective &amp; strategies are enforced</li> <li>In longer term (after 30 yrs), TSA deciduous LTHL reduced by 6% or 30,000 m3/yr. (to 410,000 m3/yr.) due to combination of LRMP strategies and (FPC-linked) Biodiversity Options</li> <li>Otherwise, similar to Base Case</li> </ul>
<b>Agriculture</b>	<ul style="list-style-type: none"> <li>Accounts for ~10-12% of Plan Area jobs</li> <li>Main use of Crown land is range for cattle</li> <li>10 % of Plan Area in MoF range tenures and 12% of this tenured area is "specially managed" in river corridors</li> <li>19% of Plan Area in ALR, much of which is private land; 10% of ALR is "specially managed" in river corridors</li> </ul>	<ul style="list-style-type: none"> <li>3.3% of range tenures in new (Base Case) PAs</li> <li>2.1% of ALR in new (Base Case) PAs</li> <li>Likely increased costs to ranching sector due to FPC, but assistance may be available from Grazing Enhancement Fund</li> <li>No losses in existing jobs due to Base Case initiatives (FPC, PAS, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>3.3% of range tenures in new PAs, but these tenures are to be maintained; 12% of range tenures in SMZs.</li> <li>2.1% of ALR in new PAs (mostly Peace-Boudreau) but no operations precluded; 10% of ALR in SMZs</li> <li>Supportive strategies &amp; likely reductions in wildlife/range conflicts</li> <li>Otherwise, similar to Base Case</li> </ul>
<b>Energy</b>	<ul style="list-style-type: none"> <li>Accounts for at least 4% of Plan Area jobs</li> <li>Ministry of Energy &amp; Mines (MEM) estimates there are 2.9 (Trillion cubic feet) Tcf of proven &amp; 21.6 Tcf of potential gas reserves in Plan</li> <li>Gas production from Plan Area expected to increase over at least the next 20 years</li> <li>High coal-bed methane potential if gas prices rise enough &amp;/or costs lowered</li> <li>Province still maintaining flood reserves for potential BC Hydro Site C dam, but project appears dormant at this time</li> </ul>	<ul style="list-style-type: none"> <li>No loss in available <i>proven</i> oil/gas reserves; 6% decline (to 20.4 Tcf) in availability of <i>potential</i> gas reserves due to FPC/PAS, but gas production still expected to rise over next 20 yrs</li> <li>65 Tenures (4% of all tenures &amp; 1% of all tenured area) overlain by new (Base Case) PAs</li> <li>RPAT (Base Case) proposed PA (i.e., Peace-Boudreau) overlays Site C flood reserves</li> <li>Some "foregone opportunities," but no losses in existing jobs due to Base Case initiatives (e.g., FPC, PAS)</li> </ul>	<ul style="list-style-type: none"> <li>Additional 6% reduction (to 19 Tcf) in availability of <i>potential</i> gas reserves, resulting in production rising more slowly than in Base Case, but still no loss in existing petroleum-related jobs for at least the next 20 yrs (however, further "foregone opportunities" )</li> <li>Appears that all 65 tenures in new PAs would be grand-fathered</li> <li>PA designation for Peace-Boudreau not intended to preclude eventual Site C opportunity</li> <li>Higher costs from LRMP strategies, otherwise similar to Base Case</li> </ul>

## SOCIO-ECONOMIC ASSESSMENT SUMMARY MATRIX

Resource Sector	"Pre-FPC" Timber Supply Review Management Regime & Trends	Base Case Management Regime & Trends (including TSR, AAC Rationale, FPC, PAS)	Implications of Proposed LRMP
<b>Coal/Minerals</b>	<ul style="list-style-type: none"> <li>Key component is coal, accounting for ~17% of Plan Area jobs in early 1990's, but sector has since down-sized</li> <li>World mineral prices and market demand are key drivers for this sector</li> <li>92,042 ha of High Coal Potential and 99,482 ha of Coal Tenures identified by Ministry of Energy &amp; Mines (MEM)</li> <li>2% of High Potential Coal lands and 6% of Tenures "specially managed" in river corridors</li> <li>Highly uncertain outlook for the 2 existing large coal mines in Tumbler Ridge after 2003</li> </ul>	<ul style="list-style-type: none"> <li>0.3% of High Potential Coal lands in new (Base Case) PAs</li> <li>0.7% of Coal Tenures in new (Base Case) PAs</li> <li>No losses in existing resident jobs due to Base Case initiatives (FPC, PAs, etc.), but potentially some "foregone opportunities" for future mining jobs (although very uncertain)</li> <li>Otherwise, similar to TSR regime</li> </ul>	<ul style="list-style-type: none"> <li>0.3% of High Potential Coal lands in new PAs &amp; 38% of in SMZs &amp; E. Slopes RMZ</li> <li>0.7% of Coal Tenures in new PAs and 16% in SMZs &amp; East Slopes RMZ</li> <li>Of 25 proven coal prospects, 1 is in a new PA (Kakwa North); 5 estimated to lie in SMZs, East Slopes, or Alberta Plateau RMZs</li> <li>Significant amounts of (identified) High Potential Metallic Mineral lands in SMZs, East Slopes, and Alberta Plateau RMZs</li> <li>Phosphate tenures in proposed Wapiti PA is a negotiation/compensation issue for government</li> <li>LRMP management strategies will increase costs and/or possibly preclude some exploration, otherwise similar to Base Case</li> </ul>
<b>Tourism, Recreation &amp; Guide-Outfitting</b>	<ul style="list-style-type: none"> <li>Accounts for ~6-8% of Plan Area jobs (key sub-sector linked to changes in Crown land use is back-country tourism/recreation)</li> <li>11 Guide-Outfitter tenures cover 93% of the Plan Area, of which 2% is currently in existing Parks</li> <li>3% of area is ROS1, 29% is ROS2, and 23% is ROS3; 11% is Undeveloped Watersheds (UW) - minimal amounts in existing PAs</li> <li>5% of Plan Area currently identified as High Visually Sensitive Areas</li> <li>Key wilderness values declining due to expanding resource development</li> </ul>	<ul style="list-style-type: none"> <li>7% of Guide-Outfitter tenures in (Base Case) PAs</li> <li>11% of combined ROS 1 &amp; 2 classified lands &amp; 32% of UW areas in (Base Case) PAs</li> <li>17% of High Visually Sensitive areas in (Base Case) PAs</li> <li>Reduced rate of decline in back-country &amp; wilderness values vs. TSR regime</li> </ul>	<ul style="list-style-type: none"> <li>Same % of resource values in PAs as Base Case</li> <li>Existing G-O tenures likely honoured in new PAs; 41% of G-O tenures in SMZs or East Slopes/Alberta Plateau RMZs</li> <li>17% of High Visually Sensitive areas in PAs &amp; 30% in SMZs</li> <li>Sector will benefit in short-medium term, but long term viability of some nature-based businesses still at risk due to expanded access network and resulting compromises to wilderness values</li> <li>Otherwise, similar to Base Case</li> </ul>
<b>Trapping</b>	<ul style="list-style-type: none"> <li>83 registered traplines, many held by First Nations</li> <li>Marten and fisher populations declining due to reductions in habitat and possible excessive trapping</li> </ul>	<ul style="list-style-type: none"> <li>Reduced risks for marten (see environmental assessment) and possible reduced risks to fisher due to FPC, but populations still likely to decline over long term</li> </ul>	<ul style="list-style-type: none"> <li>LRMP will maintain existing trapping opportunities in new PAs</li> <li>Management strategies in will further reduce threats to populations, but risks still considered moderate, with commensurate impacts to long term trapping incomes</li> </ul>

## ENVIRONMENTAL ASSESSMENT SUMMARY MATRIX

Resource Value	"Pre-FPC" Timber Supply Review Management Regime & Trends	Base Case Management Regime & Trends (including TSR, AAC Rationale, FPC, PAS)	Implications of Proposed LRMP
<b>Protected Areas Strategy &amp; Ecosystem Representation</b>	<ul style="list-style-type: none"> <li>1.7 % of Plan Area in existing Protected Areas (PAs), which would achieve some representation in only 2 of 6 ecosections and 3 of 6 major subzone variants</li> <li>BWBSwm1, BWBSwk1, ESSFmv2 subzone variants under-represented</li> <li>Remaining areal extent of all subzones at high risk (&gt;80% of each subzone in "enhanced development" zone type of management)</li> </ul>	<ul style="list-style-type: none"> <li>6.8 % of Plan Area in (Base Case) PAs; these PAs would achieve increased representation in all (6) ecosections and all major (6) subzone variants</li> <li>Significant increase (&gt; double the amount) in representation of all subzones compared to TSR regime</li> <li>Significant decrease in risk to subzone/variants due to reduction in the total amount of subzone/variant occurring in enhanced development; only one subzone (BWBWmw1) considered at risk (&gt;50% in enhanced zones)</li> </ul>	<ul style="list-style-type: none"> <li>Same as Base Case, since it is assumed that the provincial Protected Areas Strategy (PAS) would have been implemented to fulfill the government's ~6.5% Dawson Creek TSA target even with no LRMP, and that government would have chosen similar PAs as did the LRMP</li> </ul>
<b>Old Growth, Riparian Habitat, &amp; Connectivity</b>	<ul style="list-style-type: none"> <li>92% of gross land base in enhanced development zones</li> <li>Old growth and mature deciduous forests at very high risk: 95% of old growth coniferous &amp; 87% of mature deciduous stands in Timber Harvesting Land Base (THLB) remain in enhanced development zones</li> <li>Species dependent on old growth conifer and mature deciduous ecosystems likely to decline in the short-term; continued and rapid decline in biodiversity in Plan Area due to loss of old growth, fragmentation &amp; road access.</li> </ul>	<ul style="list-style-type: none"> <li>37% of Plan Area in enhanced zones - species dependent on Old Growth conifer ecosystems likely to show reduced rate of decline</li> <li>Moderate reduction (to 58%) in the amount of mature and old deciduous forests to be managed in enhanced zones, but species dependent on mature deciduous forests remain at moderate-high risks</li> <li>Reduced risks to species dependent on riparian habitat, particularly birds &amp; small mammals due to FPC <i>Riparian Management Areas</i> and <i>Wildlife Tree Patches</i>.</li> <li><i>Forest Ecosystem Networks</i> (FENs) may help retain riparian upland connectivity; overall, however, increased fragmentation is expected over time.</li> </ul>	<ul style="list-style-type: none"> <li>34% of Plan Area in "Enhanced RMZs," similar to Base Case</li> <li>However, more certainty that biodiversity will be addressed due to LRMP management objectives and strategies</li> <li>Reduced risk to riparian upland habitats due to management strategies in River Corridor SMZs</li> <li>Otherwise, similar to Base Case.</li> </ul>
<b>Warblers</b>	<ul style="list-style-type: none"> <li>Warblers dependent on mature deciduous upland forests remain vulnerable since 88% of warbler habitat (deciduous forests) in enhanced development zones (i.e., Low Biodiversity) -</li> <li>Risk very high</li> </ul>	<ul style="list-style-type: none"> <li>Reduced risk to warblers since 63% of warbler habitat in enhanced zones &amp; 23% in zones that would likely be "specially managed" even if no LRMP</li> <li>Overall risks remain high</li> </ul>	<ul style="list-style-type: none"> <li>58% of warbler habitat in Enhanced RMZs; LRMP results in 25% of warbler habitat in Multi-Value RMZs &amp; 12% in SMZs</li> <li>Overall, risks are moderate-high.</li> </ul>
<b>Fur-bearers (e.g., Marten)</b>	<ul style="list-style-type: none"> <li>Almost all (93%) of high capability marten habitat in enhanced development zones, so populations would decline to very low levels over time as supply of old and mature conifer forests decreases</li> </ul>	<ul style="list-style-type: none"> <li>Reduced risk to fur-bearers due to less habitat in enhanced zones</li> <li>FPC <i>Riparian Management Areas</i> and <i>Wildlife Tree Patches</i> will provide some required habitat attributes, however, upland habitats remain at risk</li> </ul>	<ul style="list-style-type: none"> <li>General RMZ designations over most of fur-bearer habitat indicate moderate risks of population decline in long term</li> </ul>

## ENVIRONMENTAL ASSESSMENT SUMMARY MATRIX (cont.)

Resource Value	"Pre-FPC" Timber Supply Review Management Regime & Trends	Base Case Management Regime & Trends (including TSR, AAC Rationale, FPC, PAS)	Implications of Proposed LRMP
<b>Mountain Goat</b>	<ul style="list-style-type: none"> <li>Virtually all (&gt;99%) of high capability goat habitat in enhanced development zones</li> <li>Mountain Goat populations likely to decline over the long term due to increased access and range fragmentation</li> </ul>	<ul style="list-style-type: none"> <li>Significant reduction in risk to mountain goat populations. Over half (51%) of winter ranges are in more compatible zones due to government initiatives in the absence of an LRMP (e.g., Grizzly/Caribou zones as per <i>AAC Rationale</i>) &amp; a further 21% in new (Base Case) PAs</li> <li>Overall, risk considered low-moderate</li> </ul>	<ul style="list-style-type: none"> <li>Similar to Base Case, with 51% of winter ranges in SMZs, East Slopes, &amp; Alberta Plateau RMZs, and 21% in new PAs</li> </ul>
<b>Woodland Caribou</b> (Blue-listed)	<ul style="list-style-type: none"> <li>Virtually all (&gt;99%) of high capability caribou winter range in enhanced development zones</li> <li>Caribou populations would likely decline over the long term due to loss of old growth forests, increased access, &amp; range fragmentation</li> </ul>	<ul style="list-style-type: none"> <li>Significant reduction in risk to woodland caribou populations: over half (52%) of winter ranges are in more compatible zones due to government initiatives in the absence of an LRMP (e.g., Grizzly/Caribou zones as per <i>AAC Rationale</i>)</li> <li>Overall, risk considered moderate.</li> </ul>	<ul style="list-style-type: none"> <li>Similar to Base Case, with 52% of winter ranges in SMZs, East Slopes, &amp; Alberta Plateau RMZs</li> </ul>
<b>Stone's Sheep</b> (Blue-listed) & <b>Rocky Mountain Bighorn Sheep</b>	<ul style="list-style-type: none"> <li>100% of high capability mountain sheep winter range remains at risk</li> <li>Populations would likely decline over the long term due to increased access and range fragmentation</li> </ul>	<ul style="list-style-type: none"> <li>All high capability winter range in more compatible zones (e.g., Grizzly/Caribou zones as per <i>AAC Rationale</i>), including 63% in (Base Case) PAs</li> <li>Mountain Sheep populations likely to remain stable in short and long-term</li> </ul>	<ul style="list-style-type: none"> <li>Similar to Base Case, with 25% of high capability winter range in SMZs, 12% in East Slopes RMZ, and 63% in new PAs</li> </ul>
<b>Elk</b>	<ul style="list-style-type: none"> <li>Majority (73%) of elk winter range in enhanced development zones</li> <li>Populations likely to decline over time due to increased access.</li> <li>Risk considered high</li> </ul>	<ul style="list-style-type: none"> <li>Likelihood of maintaining elk populations significantly increased due to reduction in the amount of elk winter range in enhanced zones (18% remaining) from new (Base Case) PAs and other government initiatives in the absence of an LRMP (e.g., Caribou/Grizzly zones as per <i>AAC Rationale</i>)</li> <li>Risk considered low-moderate</li> </ul>	<ul style="list-style-type: none"> <li>Similar to Base Case, due to new PAs, SMZs, &amp; Alberta Plateau RMZ</li> </ul>
<b>Grizzly Bears</b> (Blue-listed)	<ul style="list-style-type: none"> <li>Almost all (91%) of high capability grizzly bear habitat in enhanced development zones</li> <li>Populations likely to decline to very low levels over the long term due to increased access and habitat displacement</li> </ul>	<ul style="list-style-type: none"> <li>Significantly reduced risks to grizzly bears due to government initiatives in absence of LRMP (e.g., much more high capability habitat in Grizzly zones as per <i>AAC Rationale</i>); another 14% in new (Base Case) PAs considered to further reduce risks further</li> <li>Overall, grizzly bear populations likely to remain stable</li> </ul>	<ul style="list-style-type: none"> <li>Similar to Base Case: 77% of high capability habitat in SMZs and East Slopes RMZ &amp; 14% in new PAs.</li> <li>Access management strategies provide increased certainty that adequate mitigation measures will be implemented.</li> </ul>

**Note:** Risk refers to the probability or likelihood of an adverse event that may result in a decline in wildlife populations. It is a qualitative judgement designed to measure relative risk levels (Very Low → Very High).

## I. Introduction & Significance of the "Base Case" Land Use Regime

This report consists of a socio-economic and environmental assessment of the implications of the *Recommended Dawson Creek Land and Resource Management Plan (June 1998)* as generated by the Dawson Creek Land and Resource Management Plan (LRMP) Working Group, as compared to the "Base Case" land use management regime. The Base Case consists of current/anticipated socio-economic and environmental trends, including the best estimate by government's LRMP Inter-agency Planning Team (IPT) of the "default" crown land management regime that would occur in the absence of the LRMP.

The assessment is a qualitative (i.e., descriptive) and quantitative (i.e., numeric) analysis of the key implications of the Plan vs. the Base Case, given existing knowledge of the cause/effect relationships between Crown land use changes and various socio-economic/environmental values. Since the LRMP document is a strategic plan which provides "high level" direction to lower level planning, the assessment must also take a "broad-brush" approach and thus assesses only *the main differences between the Base Case and the proposed Land Use Plan*.

The assessment utilizes the Geographic Information System (GIS) area statistics and resource analyses for timber, mining, and energy values undertaken by government agencies. The assessment was undertaken independently from the LRMP process, and was authored by the Economics Branch of the Ministry of Employment & Investment (with assistance from Robinson Consulting and J. Paul and Associates) and by Eliot Terry (R.P. Bio.) of Keystone Wildlife Research. The assessment is consistent with the approach specified in the provincial government's *Social and Economic Impact Assessment for Land and Resource Management Planning in BC - Interim Guidelines*, 1993.

The Base Case includes the implications of the *Timber Supply Review* (TSR) management regime, the *Forest Practices Code* (FPC), the *Protected Areas Strategy* (PAS), and other "current management" initiatives, e.g. the caribou and grizzly management intentions outlined in the most recent Dawson Creek TSA Allowable Annual Cut (AAC) determination by the Chief Forester.<sup>1</sup> The impacts of new Protected Areas are included in the Base Case since it was not considered to be appropriate to attribute their implications to the LRMP, given that PAS is a government initiative that would be implemented in the Plan Area (at government's target level of an incremental 5.1% of the Plan Area) even if the LRMP did not exist.<sup>2</sup>

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<sup>1</sup> See *Dawson Creek TSA: Rationale for Allowable Annual Cut Determination*, Ministry of Forests, December 30, 1996, p. 30. It is apparent from this document that the Ministry of Forests intends on including and managing for at least 348,000 ha. of Caribou habitat and 369,000 ha. of Grizzly habitat (not including TFL land) in its Base Case management regime, which were not included in the TSR document of September 1994.

<sup>2</sup> Normally in the Base Case, the government's Regional Protected Areas Team (RPAT) Areas of Interest that were prioritized to meet the Plan Area's provincial PAS target for Dawson Creek (an incremental 5.1% of the Plan Area) are used as the "best estimate of Protected Areas that would likely occur without an LRMP." However, due to a mapping problem, this was not feasible for the Dawson Creek analysis. It should also be noted that the area statistics quoted in this report were generated when the former Chain Lakes proposed Protected Area was part of a preceding proposed "Working Scenario" land use plan (rather than the current Bearhole Lakes PA) and when the Wildlife/Coalfield Special RMZ was larger: thus the area statistics reported will not be exactly as per the 1998 Land Use Plan, however, this will not affect the key conclusions reached in the assessment.

The report undertakes the analysis at three levels of resource management: the first is an assessment of the implications of the management regime in place up to very recently, referred to as the (pre-Forest Practices Code) "TSR" regime; secondly, an assessment of the (evolving and forward-looking) "Base Case" management regime within the Dawson Creek TSA in the absence of a Land Use Plan; and last, the analysis of the likely effects (over and above the Base Case) of the Land Use Plan. However, the incremental impacts of implementing the Plan discussed in this report were assessed primarily by comparing it to the Base Case, because the latter most closely reflects management practices that would take place into the future with no LRMP.<sup>3</sup> By comparing the Plan mainly to the TSR regime (which, for example, does not include the FPC nor the Chief Forester's 1996 *AAC Rationale*), the impacts of the Plan would be exaggerated.

The Plan's Resource Management Zones (RMZs) have been designated by the LRMP Table into 13 land use categories: Existing Parks, Proposed Protected Areas, four Special RMZs (Wildlife/Recreation, Wildlife/Coalfield, Major River Corridors, Cultural/Heritage), four General RMZs (Foothills, Plateau, Alberta Plateau, & Eastern Slopes), two Enhanced RMZs (South Peace & Grazing Reserves), and an Agriculture/Settlement RMZ. To simplify the analysis, these zones were grouped into six categories,<sup>4</sup> as per Table 1.

In addition, in order to have appropriate "benchmark" GIS area statistics to compare the Plan to, the IPT labelled each RMZ (using the same designations as contained in the Land Use Plan) based upon what level of management would most likely prevail in both the TSR and the Base Case regimes. Table 2 provides a summary of the distribution of these land use designations for the TSR, Base Case and Land Use Plan.<sup>5</sup>

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<sup>3</sup> During a meeting with the LRMP Table in March 1996, the group expressed a desire to have the implications of the "Status Quo" separated from other "Base Case" initiatives, such as the *Forest Practices Code* and the *Protected Areas Strategy*. The management regime in place at the time the *Dawson Creek TSA Timber Supply Review* (1994) was published is utilized as it comes closest to being the "default land use plan" in place before the introduction of FPC, PAS, etc. However, in the assessment, less emphasis is placed upon the TSR regime as a "benchmark," since the Base Case is more appropriately defined as "the situation that would likely prevail in the absence of the LRMP." This latter definition therefore must take into account the FPC (including the Biodiversity Guidebook), PAS, new caribou and grizzly strategies for the area as documented in the Chief Forester's most recent AAC determination, etc.

<sup>4</sup> The "Alberta Plateau" and "East Slopes" RMZs have been separated from the remaining Multi-Value RMZs because the management strategies are almost as restrictive as for the Special Management RMZs. For example, the LRMP-proposed general biodiversity ratings are from Intermediate to High, whereas for the "Foothills" and "Plateau" Multi-Value RMZs, the rating is Intermediate. In addition, only a minority of the Foothills & Plateau RMZs (i.e., Cust Cr., Butler Ridge, Boucher L., Boudreau L., Cameron-Moberly L., and Chetwynd-Moberly L.) are subject to "Sensitive Access Management" (defined on p. 32). Alternatively, all of the Alberta Plateau and East Slopes RMZs are subject to this most restrictive of the three levels of access management, as are the Wildlife/Recreation and Wildlife/Coalfield Special RMZs. Finally, from the wording, Sensitive Access Management could apply to both to smaller, specific sites as well as to larger areas with significant resource values (e.g., see p. 120 re Hook Lk.), and while development may not be precluded, it could be more costly.

<sup>5</sup> It should not be concluded that the overall management regimes in the Plan and those that would prevail in the Base Case are therefore almost identical. While there may be little difference in terms of the gross area statistics, the key "value-added" by the proposed Land Use Plan are its publicly-crafted and documented management objectives and strategies, which form the key part of any Plan and would not exist in the Base Case.



**Table 1: Land Use Designations - Assessment vs. LRMP Land Use Plan**

Designations used in Assessment	Designations as per Land Use Plan Map
1. Enhanced RMZs (35.1% of Plan Area)	Agriculture/Settlement Land Use Areas (13.3%) South Peace & Grazing Reserve RMZs (21.8%)
2. Multi-Value Foothills and Multi-Value Plateau RMZs (18.8%) 3. Alberta Plateau RMZ (11.7%) 4. Eastern Slopes RMZ (14.1%)	General Resource Management Zones (44.6%) (includes Multi-Value Foothills, Multi-Value Plateau, Alberta Plateau, and Eastern Slopes RMZs)
5. Special Resource Management Zones (13.1%)	Special Resource Management Zones (13.1%) (includes Major River Corridors, Wildlife/Coalfield, Wildlife/Recreation, & Cultural/Heritage RMZs)
6. Existing & Proposed Protected Areas (6.8%)	Existing (1.7%) & Proposed Protected Areas (5.2%)

**Table 2: Allocation of Plan Area Gross Land Base of Plan Area by RMZ Category\***

	Protected Areas	Special RMZs	Alberta Plateau RMZ	Eastern Slopes RMZ	Multi-Value RMZs	Enhanced RMZs
TSR (pre-FPC)	1.7%	6.3%	-	-	-	92%
Base Case	6.8%	14.3%	11.7%	15.6%	14.4%	37%
Land Use Plan	6.8%	13.1%	11.7%	14.1%	18.8%	35.1%

\* Gross Land Base of Plan Area estimated at 2,966,225 ha.

It is apparent that due to the combination of government initiatives in the Base Case and the "zoning" undertaken by the LRMP Working Group, significant changes Crown land management have occurred since the (pre-FPC) TSR regime. *However, the areal differences between the Base Case and the Plan are not significant, and therefore it is the Plan's management objectives and strategies in the document that provide the key differences, as noted throughout this assessment.*

## 2. Forestry

### 2.1 Background

The Ministry of Finance and Corporate Relations' (MFCR) economic dependency analysis (using 1991 Census labour force data, since 1996 data not available at the time of writing) estimates that direct employment in the forest sector is about 1,470 jobs, or 12-14% of the local economy. The major processors are in Chetwynd (Canfor and West Fraser saw mills and Louisiana Pacific's pulp mill), and Dawson Creek (Louisiana Pacific's Oriented Strand Board plant). Of the Plan Area's total Gross Land Base (GLB), an estimated 1,086,441 ha. of Crown land (786,295 ha. in coniferous and 300,146 ha. in deciduous leading stands) is considered available for commercial

timber harvesting, i.e., is the pre-FPC "Timber Harvesting Land Base" (THLB); note these amounts also include in Canfor's Tree Farm License (TFL) 48. The standing volume of mature/old growth timber in the THLB is estimated to be almost 78 million cubic metres (m<sup>3</sup>) of coniferous leading stands (mainly spruce and lodgepole pine) and just over 26 million m<sup>3</sup> of deciduous leading stands (aspen and cottonwood). There is also an estimated 66 million of immature coniferous and 11 million m<sup>3</sup> of immature deciduous stands, which will support future harvest levels.

The deciduous component is almost entirely allocated under two Pulpwood Agreements (PA 10 and PA 13) of 452,000 m<sup>3</sup> each, held by Louisiana Pacific. The fibre requirements, at full capacity, for their Dawson Creek OSB plant and Chetwynd pulp mill are about 600,000 m<sup>3</sup>/yr and 450,000 m<sup>3</sup>/yr respectively. Under the terms of the Agreements, the licensee is to make "best efforts" to us fibre from other than Crown sources. This would be supplemented by crown harvests from to the extent the alternative sources fell short of the required volumes. Recent estimates are that only about 200,000 m<sup>3</sup> annually is being harvested via the Pulpwood Agreements.

The provincial government's Chief Forester sets the AAC for Crown forest lands after weighing a number of factors brought to his attention during the TSR process. The current AAC determinations,<sup>6</sup> which are likely to remain in effect to December 30, 2001, are compared to the preceding AAC in Table 3.

**Table 3: Allowable Annual Cut in Plan Area**

	Dawson Creek TSA	TFL 48
<b>Current AAC (as at Dec. 30, 1996)</b>		
Coniferous (leading)	846,533	460,000
Deciduous (leading)	886,500	54,000
Total	1,733,033*	514,000
<b>Previous AAC</b>		
Coniferous (leading)	846,533	
Deciduous (leading)	995,331	
Total	1,841,864*	410,000**

\* Excludes allocated woodlots,

\*\* Previous TFL AAC did not set separate deciduous and coniferous.

TFL 48 is held by Canadian Forest Products (Canfor) Ltd., but the TSA's AAC is made available for harvest under a variety of renewable and non-renewable forest licences. West Fraser Mills Ltd. holds a renewable forest licence for about 50% of the coniferous TSA AAC, and Canfor also holds a renewable licence for about 87,000 m<sup>3</sup>. Most of the remaining available coniferous harvest volume is made available under the Small Business Forest Enterprise Program.

<sup>6</sup> Pedersen, L. *Dawson Creek Timber Supply Area: Rationale for Allowable Cut Determination* (Dec. 30, 1996), Ministry of Forests. The AAC determination for Tree Farm Licence 48 also took effect on this date.

## 2.2 Implications of the Base Case, and Land Use Plan on Projected Harvest Flows

Of the overall 1,086,000 ha. estimated (pre-FPC) Timber Harvesting Land Base, about 786,000 ha. (82% being mature/old growth) is classified as coniferous and 300,000 ha. (47% mature/old growth) is judged to be deciduous. The Land Use Plan places almost 4% of the coniferous THLB in Protected Areas and 7% in Special Management; correspondingly, 3% of the deciduous THLB overlays Protected Areas and 13% is in Special Management Zones (SMZs defined as the Wildlife/Recreation, Wildlife/Coalfield, Cultural/Heritage, and Major River Corridors RMZs).

Potential harvest flow estimates were prepared by Timberline Forest Inventory Consultants for the (pre-FPC) TSR regime, Base Case, the Plan, and the Plan as assessed at the Landscape Unit level, with the latter using the Biodiversity Emphasis Options (BEOs) that the IPT expected would be implemented as of May 1998 (see Appendix I), which occurred concurrently with the development of the Prince George Forest Region's Landscape Planning Strategy (RLPS). (Note that the harvest flow estimates are not forecasts of AACs per se, the setting of which is the responsibility of the provincial Chief Forester). The timber analysis indicates that there is no downward impact on the *current harvest levels* for the TSA coniferous, TFL deciduous volumes, and only a marginal effect on TFL coniferous for either the Base Case or the Plan, simply because current harvest levels are far enough below the potential Long Term Harvest Levels to absorb the impacts; however, it is acknowledged that some opportunities for higher harvest levels are lost.<sup>7</sup>

Note that due to the "broad-brush," strategic level of the Plan's management objectives and strategies, it is very difficult to assess their timber impacts prior to implementation and thus such impacts may be somewhat higher. In addition, the Plan may cause licensees to incur higher harvesting costs, about which more is said in Sections 2.3 and 2.4. Details pertaining to the estimated timber harvest impacts are summarized in Table 4, with the area analysis breakdown of the Landscape Unit analysis contained in Table 5.

However, there are harvest implications for the TSA deciduous component, due mostly to factors that are attributed to the Base Case, e.g. natural stand succession (from deciduous to coniferous) in the absence of fire. The combined deciduous requirement for the OSB plant and pulp mill is in the area of 1 million m<sup>3</sup>/yr., but only about 200,000 m<sup>3</sup>/yr. of the 886,500 m<sup>3</sup>/yr. maximum under the Pulpwood Agreements is being cut. Under the TSR regime alone (i.e., even without the FPC, new protected areas, or the Plan), the potential deciduous harvest is projected to fall by 46% to 480,000 m<sup>3</sup>/yr over the next 30 years. The FPC<sup>8</sup> is estimated to result in a further reduction in the Long

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<sup>7</sup> There is an argument that the unallocated small pine resource should not be considered as a mitigating factor (due to the current inability of local mills to process the resource) in leading to the conclusion that there are no impacts on existing harvest/jobs from the LRMP and other government initiatives. However, even if one subtracts Timberline's estimated small pine potential harvest of 100,000 m<sup>3</sup>/yr. from the post-LRMP LTHL level of 896,000 m<sup>3</sup>/yr., it is apparent that the 1990-96 average harvest level of 771,000 m<sup>3</sup>/yr. (Source: MoF Valuation Branch) can be maintained even without that resource. Moreover, many mills in the BC interior are utilizing Height Class 2 small pine, although incremental capital investments (likely several million dollars) are necessary for such utilization. For example, dimension lumber mills in the Prince George TSA are currently utilizing a 250,000 m<sup>3</sup>/yr. small pine license.

<sup>8</sup> Includes effects of riparian areas and wildlife tree patches only. Biodiversity Emphasis Option impacts estimated separately.

Term Harvest Level (LTHL) to 447,000 m3/yr. New protected areas will have no impacts for 20 years, and then are expected to cause the LTHL to decline to 440,000 m3/yr., with a combination of the Plan and biodiversity requirements causing a further fall to 410,000 after 20-30 years, subject to Chief Forester AAC determinations. Such a conclusion is bolstered by the estimated inventory of standing mature deciduous volume of about 26 million m3/yr.

**Table 4: Estimated Long Term Harvest Levels in Plan Area ('000 m3/yr.)**

	TSR (Pre-FPC)	FPC	New PAs	LRMP Strategies	Landscape Units*	Total	Current AAC
TFL Deciduous	66	58	57	57	54	54	54
TSA Deciduous	480	447	440	425	410	410**	887
TFL Coniferous	534	486	462	462	454	454	460
TSA Coniferous	986	886	846	846	796	796	747
TSA Small Pine***	-	-	-	-	52	52	100-150

**Source:** Timberline Forest Inventory Consultants, for the Ministry of Forests.

\* Using April 1997 anticipated Biodiversity designations, not the Interim BEO's resulting from the RLPS. Note for the RLPS, there is an estimated net change of 72,609 ha. of coniferous or mostly coniferous THLB in more constraining BEOs vs. the April 1997 scenario assessed by Timberline; there is also 67,795 ha. of deciduous THLB in less constraining BEOs. Thus the actual figures should be marginally lower for coniferous and marginally higher for deciduous.

\*\*This LTHL would be reached in approximately 20-30 years

\*\*\* The timber supply analysis indicates that a harvest of 100,000 m3/yr. for 20 yrs. is achievable.

**Table 5: Breakdown of Plan Area by Biodiversity Emphasis Option (BEO) Category**

	Low Biodiversity	Intermediate Biodiversity	High Biodiversity	Protected Areas
Base Case (GLB)	56%	31%	6%	7%
Land Use Plan (GLB)	41%	41%	11%	7%
Base Case (THLB)	59%	31%	6%	4%
Land Use Plan (THLB)	43%	44%	9%	4%
RLPS* (THLB)	41%	50%	10%	n/a

\* Refers to "Regional Landscape Planning Strategy" for PG Forest Region; see also Appendices I and III.

**Note:** GLB = Gross Land Base (2,966,225 ha.); THLB = Timber Harvesting Land Base (1,086,441 ha.)

There are two other mitigating factors: (1) the timber supply model assumes that the full AAC of 886,500 is being harvested - since it is not, the "step-down" to the LTHL should occur more slowly than indicated in Table 4, and (2) deciduous supplies could be made available from other TSAs where not fully allocated, e.g. in the Ft. St. John TSA.

### 2.3 Socio-economic Implications of the Base Case & Land Use Plan for the Forest Sector

The foregoing implies there is a low risk of forest sector job impacts from harvest reductions due to Base Case or LRMP initiatives, although the risk is higher in 20-30 years for the current Dawson Creek OSB processor dependent on the deciduous resource, but for reasons almost exclusively having to do with the Base Case.

From the perspective of local processing facilities, the combined annual coniferous fibre requirement of the Plan Area's two sawmills is about 1.2 to 1.4 million m<sup>3</sup>/yr.<sup>9</sup> The Canadian Forest Products sawmill in Chetwynd can supply about 90% of its mill requirements of 600,000-700,000 m<sup>3</sup>/yr. from local crown sources, given its TFL AAC of 460,000 m<sup>3</sup>/yr, its TSA apportionment of 87,000 m<sup>3</sup>/yr. and assuming it can acquire 50% of TSA Section 16 sales, which currently total 135,000 m<sup>3</sup>/yr.<sup>10</sup>

The West Fraser mill, also in Chetwynd and also with a capacity of 600,000-700,000 m<sup>3</sup>/yr., has a current TSA apportionment of 410,000 m<sup>3</sup>/yr., and assuming it can regularly acquire 50% of Section 16 sales, its conventional sawlog supply from crown sources can only account for 65%-80% of its requirements. This mill is therefore in a more vulnerable position if future coniferous timber supplies from private and/or non-Plan Area sources were to occur. However, as discussed above, coniferous harvests are not expected to fall below current levels.

The situation for the deciduous TSA harvest is more complex, however, since the combined deciduous requirement for the OSB plant and pulp mill is about 1 million m<sup>3</sup>/yr., but only about 200,000 m<sup>3</sup>/yr. of the current allowable harvest level of 886,500 m<sup>3</sup>/yr is being harvested. Thus even though the allowable deciduous harvest may fall to 600,000 m<sup>3</sup>/yr in the current management regime (including FPC) during the next decade, if private and other sources of deciduous volumes can provide approximately 400,000 m<sup>3</sup>/yr over the next decade (about one-half of the current amount being purchased), there should be no job/income impacts for approximately 20 years. In fact, there may not be any impacts for longer if about 600,000 m<sup>3</sup>/yr. can be provided from private/other sources after that time, assuming that the LTHL remains at about 400,000 m<sup>3</sup>/yr.

With respect to the issue of "foregone opportunities," it is acknowledged that without some of these government initiatives, the potential TSA/TFL coniferous and TFL deciduous harvests could be higher than current levels. But, since neither the Base Case nor the Plan appears to cause harvest levels to fall below the current AACs (with the minor exception of a 6,000 m<sup>3</sup>/yr. impact to TFL coniferous) and given the longer term (i.e., greater than 20 years) uncertainties associated with private and imported deciduous supplies, it is not considered appropriate to explicitly quantify "job"

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<sup>9</sup> Based upon a combined mill capacity of 320 million board feet annually (Source: *Major Primary Timber Processing Facilities in B.C.*, MoF, 1993) and a recovery factor of approximately 250 board ft. per m<sup>3</sup>.

<sup>10</sup> Note that total Small Business (Section 16 & 16.1) coniferous volumes billed for the period 1990-95 averaged 235,000 m<sup>3</sup>/yr., so this estimate appears conservative.

or “revenue” impacts in this assessment.<sup>11</sup> However, Table 6 provides the estimated job ratios per 1000 m<sup>3</sup>/yr. and the per m<sup>3</sup> stumpage rates, such that readers can have some idea of these values.<sup>12</sup>

**Table 6: Estimated Employment and Stumpage Coefficients for Plan Area**

	Direct Jobs (PYs/1000 m <sup>3</sup> )*	Billed Stumpage per Cubic Metre of Timber**	
		<i>Without FRBC Portion (1990-93 average)</i>	<i>With FRBC Portion (1995-96 average)</i>
TSA Coniferous	0.68	\$6.83 (Licensee) \$13.65 (SBFEP)	\$17.82 (Licensee) \$46.57 (SBFEP)
TSA Deciduous	0.78	\$0.50 (Licensee) \$1.21 (SBFEP)	\$0.50 (Licensee) \$2.02 (SBFEP)
TFL Coniferous	n/a	\$5.96	\$19.06
TFL Deciduous	n/a	\$0.47	\$0.44

Sources: G.E. Bridges & Associates, *Dawson Creek TSA Socioeconomic Analysis*, for Ministry of Forests Timber Supply Review, June 1996; Average (Stumpage) Values Billed from MoF Valuation Branch, Victoria.

\* PY's = Person-Years; note TFL coefficients likely similar to TSA coefficients.

\*\* Shown as a range (with and without FRBC) since it is arguable as to whether the FRBC component is a contribution to government revenues or simply reverts to the forest sector.

In addition to timber availability, harvesting costs are affected by the Plan's objectives and strategies, and costs are already a concern to licensees in the Base Case, due to stumpage and the FPC. It is not possible to quantitatively assess the costs of the objectives and strategies dollars<sup>13</sup> due to their “strategic” nature, however work has been done on timber cost increases for Base Case initiatives such as FRBC-related stumpage and the Forest Practices Code. The key results of a recent analysis of these recent cost increases on northern interior forestry operations is shown in Table 7, and they do indicate that costs of harvesting have risen steeply over the last several years. Note also that the government is working towards the reduction of FPC-related costs.

<sup>11</sup> Estimates of foregone resource revenues and jobs for the Oil & Gas sector are undertaken in Section 4 because petroleum is a non-renewable resource for which jobs are likely to be curtailed at some point in the future due to shrinking supplies, whereas if current timber harvests can be maintained, other things being equal, the associated current level of forestry jobs should also be maintained indefinitely. Also, note that research has demonstrated that individuals consider the sacrifice of “future potential opportunities” to be less significant than losses in existing economic activities. (See J. Knetsch, *Asymmetric Valuation of Gains and Losses and Preference Order Assumptions*, *Economic Inquiry*, Jan. 1995, pp. 134-141.), and a key purpose of Multiple Accounts Analysis is to assess significance of impacts.

<sup>12</sup> As was the case for the petroleum analysis, non-resource revenue taxes (e.g., income taxes, sales taxes, etc.) are not noted due to the conventional economic assumption that these taxes will still be paid (although perhaps at lower levels) through the utilization of same capital and labour in other pursuits. See *Social and Economic Impact Assessment for LRMP in BC, Interim Guidelines*, 1993, p. 27.

<sup>13</sup> LRMP forestry representatives also asked that “net-downs” on the timber resource be applied to the Land Use Plan's access management strategies, as was done for the natural gas analysis in Section 4. MoF is unable to specifically accommodate this request, but in its view has incorporated the majority of the key, quantifiable constraints in its timber supply impact assessment, using such tools as FPC riparian guidelines, wildlife tree patches, Biodiversity Emphasis Options, etc.

**Table 7: Northern Interior\* B.C. Delivered Wood Costs (\$/m3) 1992-1996**

	1992	1996	% Change '92-'96
Non-FPC Costs	\$32.57/m3	\$38.89/m3	19%
FPC Costs**	0	\$7.78/m3	-
Stumpage	\$8.13/m3	\$26.59/m3	227%
<b>Total</b>	<b>\$40.70/m3</b>	<b>\$73.26/m3</b>	<b>80%</b>

Source: KPMG, D. Perrin, & T.A. Simons, *Financial State of the Forest Industry and Delivered Wood Cost Drivers*, for the Ministry of Forests, April 1997.

\* Based upon a survey of 8 operations, located from Prince George northward.

\*\* FPC cost increases were in the areas of planning, longer approval periods, over-compliance, soil conservation, road/landing requirements, riparian management, and cutblock size requirements.

## **2.4 Land Use Plan Statement on Forest Practices Code vs. LRMP Impacts**

Finally, the General Management Direction's "Guiding Principles" (p. 11) contains a statement to the effect that it is the intent of the Plan that there will not be incremental reductions in operating areas, costs, etc. above and beyond those prescribed by the FPC and its regulations. There is a risk that this statement contradicts some of the more constraining management strategies that have the potential result in incremental planning/consultation and other cost increases (e.g. choice of more expensive access options, harvesting poorer quality timber, operating in more difficult terrain, etc.) beyond the FPC, for example:

- the "Sensitive Access Management" direction (p.32) that applies to approximately 35% of the Plan Area (i.e. Alberta Plateau, Eastern Slopes, Wildlife/Recreation, Wildlife/Coalfield, and some other RMZ sub-zones), which may include various restrictions, including "in special circumstances, site specific, prohibited access."
- some wildlife strategies, e.g., those for caribou (p. 110) and grizzly bear (p. 117); note these are 2 of the 5 species for which impacts from "higher level plans" (e.g., an LRMP) are allowed to exceed the government's target level as per the draft *FPC Identified Wildlife Guidebook*

More analysis would be required to determine which objectives and strategies are likely to go beyond the FPC and those which merely provide clarification for FPC implementation. (Note that even if the LRMP only clarifies the FPC, the implications of such clarification would not likely occur without the LRMP.) However, the impact assessment exercise is made more uncertain in the face of such potential contradictions.



### **3. Agriculture and Range**

#### **3.1 Background**

Agriculture has long been an important industry in the Plan Area, with grains and oilseeds grown on private lands traditionally dominating. According to the 1991 MFCR analysis, the area's agriculture sector employed approximately 1200 area residents, contributing about 10% of overall employment and 6% of personal after-tax incomes. (The likelihood that many in the sector work only seasonally is the main reason for the difference between the two proportions.) The Plan recognizes this significance in part by designating 13.1% of the Plan Area as an Agriculture/Settlement RMZ, in addition to 3.3% in a Grazing Reserves RMZ. (As noted previously, for purposes of simplifying the assessment, these RMZs are grouped with the Enhanced RMZs, as they all comprise the least development-constraining zones proposed by the LRMP.)

Crop production primarily occurs on private lands, and therefore is not subject to the LRMP. The ALR occupies the majority of the lands which are most suited for intensive agriculture (covering 558,648 ha., or 19% of the area) but other areas also exist for which arability and therefore agricultural potential can be improved. Within the ALR there are also a few large tracts of land of higher agricultural capability that are not yet developed, e.g. in the Boudreau Lake, Boucher Lake, Monias Lk., and Windy Creek sub-zones.

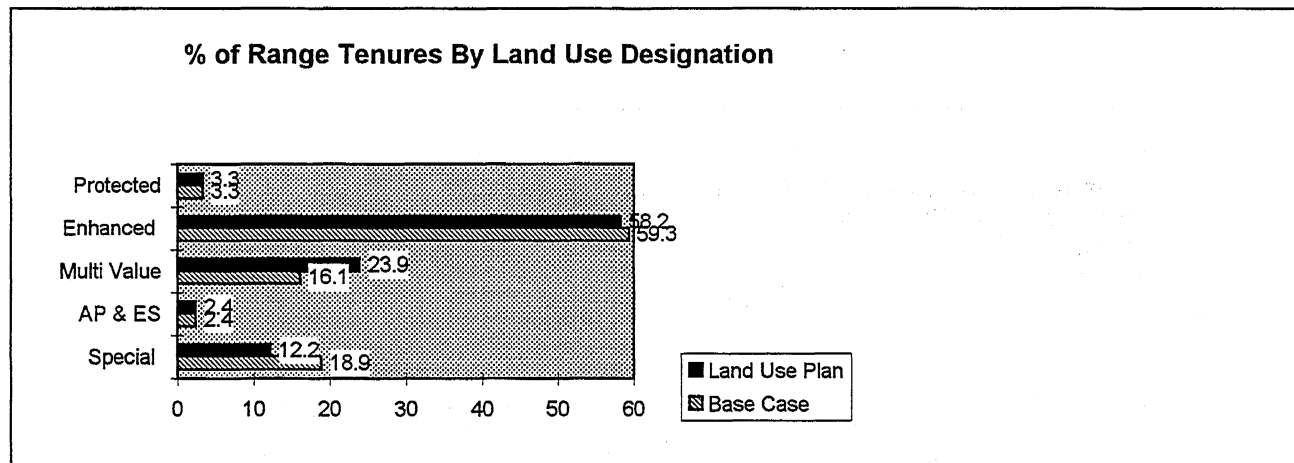
#### **3.2 Range**

Cattle ranching is highly dependent on use of Crown range for forage to sustain livestock in the summer months. Forage grown on private land is utilized for feed during the rest of the year. There is a total of 307,190 ha of range tenures, covering 10% of the Plan Area. In the TSR Regime, 88% of this tenured lands falls within Enhanced RMZs. As shown in Figure 1, under both the Base Case and the Plan, about 58% is overlain by Enhanced RMZs (mainly Grazing Reserves and Agriculture/Settlement RMZs, where virtually all of the current activity occurs).

In the Base Case and Land Use Plan, about 3% falls within proposed Protected Areas. The Plan suggests that grazing be an allowable use in Protected Areas subject to a management plan, and therefore there is no loss of AUMs over the Base Case, but future new opportunities would not be encouraged (see Appendix "F"). Moreover, the General Management Direction in the document states as an objective that new grazing opportunities are to be provided (p. 24).

Multi-Value and Special Management RMZs overlay all but 2.4% of the remaining grazing tenures, and there are few management strategies in the document that would constrain the growth of ranching. In fact, there are some that could enhance the sector, e.g., development of a forage inventory and identification of areas to increase forage production (pp. 54, 63, 78, 99, & 105). The implications of these recommendations, along with those designed to reduce agriculture/wildlife conflicts, is a likely increase in the level of certainty for current and future range opportunities.

**Figure 1: Allocation of Ministry of Forests Tenured Range Land by RMZ Category**



### 3.3 Agricultural Land Reserve

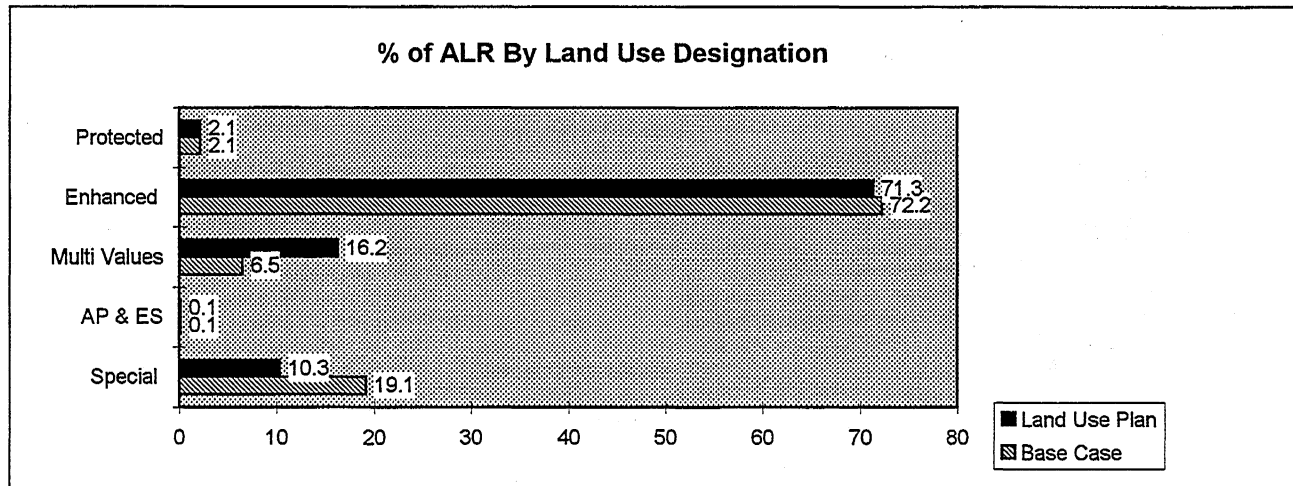
The only other mapped indicator available for this sector is Agricultural Land Reserve (ALR) lands, of which there is a total of 558,648 ha., or 19% of the Plan Area. Almost 90% of the ALR is contained in Enhanced RMZs under the TSR Regime, dropping to about 70% in the in both the Base Case and Land Use Plan, as shown in Figure 2. Just over 2% (about 12,000 ha.) falls within the proposed Protected Areas of the Base Case and Plan, which are predominantly Class 2, 3 & 4 (Canada Lands Inventory) in terms of agricultural capability - over 90% is located with the Peace-Boudreau proposed protected area, some of which is precluded anyway under the TSR regime due to the BC Lands flood reserves established for a potential future BC Hydro "Site C" project; see Table 8 for additional details.

As with range tenures, the only apparent significant difference between the Base Case and the Plan from an area statistics perspective is a shift in some ALR lands from Special RMZs to Multi-value RMZs, primarily due to a change in designation (vs. the Base Case regime) for the Boucher and Boudreau Lake sub-zones, along the Peace River.

### 3.4 Socioeconomic Implications of the Base Case & Land Use Plan for Agriculture/Range

While 2.1% of the Plan Area's ALR lands would presumably be alienated in proposed Protected Areas, there appears to be no significant impacts (and no job loss) on existing agricultural and range activities from either the Base Case or the Land Use Plan. Since virtually all of the intensive agriculture is carried out on private land, all existing range tenures in Protected Areas are "grandfathered," many management strategies are supportive of the sector, and only a small proportion of both ALR and tenured range land is contained in the Special or Alberta Plateau/East Slopes RMZs, growth in agricultural activity is poised to continue under LRMP regime. Moreover, if the Grazing Enhancement Fund can be accessed (p. 137) to mitigate possible incremental costs, any financial implications from either the FPC or Land Use Plan strategies can be reduced.

**Figure 2: Allocation of ALR Lands by RMZ Category**



**Table 8 : Estimates of ALR Lands Impacted by Proposed Protected Areas**

	Area (ha.)	Canada Land Inventory Rating
Peace-Boudreau (Goal 1)	10,943*	Class 2, 3, 4 & Organic
Elephant Ridge (Goal 1)	1554	Class 4, 5, & 6
Kiskatinaw River (Goal 2)	194	n/a
Rolla Fossil Site (Goal 2)	8	n/a

Source: Ministry of Agriculture, Fisheries and Food, Ft. St. John.

\* Some of this is in BC Lands flood reserves associated with the potential BC Hydro "Site C" project.

## 4.0 Energy

### 4.1 Background

The Plan Area contains a rich endowment of energy resources including oil and natural gas, hydro-electric and geothermal potential. As of 1991, MFCR analysis indicates that about 400 residents of the Plan Area (centred mostly around Dawson Creek, and driving at least 4% of the local economy<sup>14</sup>) work in the petroleum industry, of which about half are engaged in processing the resource, with the remainder in the exploration/extraction sub-sector. It is these latter jobs that are most closely linked with changes in Crown land use in the short-medium term, since they are quite dependent on industry's ability/willingness to add to existing reserves; the processing (and

<sup>14</sup> It is likely higher than 4%, since an estimate from the Oil and Gas Section of the Ministry of Energy & Mines indicates there may be an additional 700-800 seasonal jobs taken by non-area residents which are not accounted for in the Census data. Also, there has been growth in this sector since 1991, but regional 1996 Census data was not available at the time the report was prepared.

downstream jobs) are more dependent on existing proven reserves (which are barely impacted) and infrastructure and thus are less vulnerable in this shorter time horizon. The Census also indicates an additional 200-300 jobs in "Utilities," many of which would be in petroleum product distribution, along with a significant amount of BC Hydro jobs in the vicinity of Hudson's Hope.

Since deregulation of gas markets (in 1985), exploration for and production of natural gas in Northeast B.C. has sharply increased, with the largest discoveries in the Fort St. John and Dawson Creek areas. There are four recognized "catchment areas" (unique geologic structures within the Sedimentary Basin) in the Dawson Creek Plan Area, comprised of nearly all of the South Foothills and Deep Basin catchment areas and small proportions of the Northern Foothills and Fort St. John catchment areas. Current production is mainly from the South Foothills and Deep Basin areas. The former is relatively lightly explored, and recent discoveries indicate a very large potential resource. The Southern Foothills are expected to contribute a growing share of provincial natural gas production in the future.

#### **4.2 Proven Oil and Natural Gas Reserves**

Research by the Geological Survey of Canada provides quantitative estimates of *proven* (i.e. discovered and economic) and *potential* (i.e. not presently discovered or economic, but likely) reserves of oil and natural gas in Northeast B.C., which was used by the Ministry of Energy and Mines (MEM) to assist in assessment of the impacts on the resource.

MEM concluded that output from proven oil/gas reserves are not measurably affected by the Base Case or the Plan, since over 90% of those reserves are located in RMZs where the constraints are not onerous and only 2% of all proven gas reserves and under 1% of proven oil reserves are precluded by new Protected Areas. Even the Special RMZs are subject to the "General Management Direction" for energy which will "Provide opportunities and access for oil and gas exploration, development, and transportation" (p.26).

#### **4.3 Potential Natural Gas Reserves<sup>15</sup>**

Relative to the TSR regime, access to potential reserves are reduced in the Base Case due to the Protected Areas and because of exploration cost increases from the implementation of the FPC. MEM estimated that the Base Case would reduce the maximum potential 21.6 Trillion cubic feet (Tcf) of reserves available for discovery by 1.2 Trillion cubic feet (Tcf), which is 6% of the maximum available - of this amount, 0.6 Tcf is attributed to new Protected Areas and 0.6 Tcf is due to an assumed 3% impact of the FPC.<sup>16</sup> The LRMP management strategies are estimated to further reduce available potential reserves available by an additional 1.4 Tcf (another 6%, approximately), as per Table 9.

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<sup>15</sup> No information is available for potential oil reserves, but since oil is a much less significant resource than gas in Northeast BC, the implications of the Base Case and LRMP are expected to be minor.

<sup>16</sup> Potential reserves were reduced by 3% to reflect the higher cost of meeting FPC regulations. This might include, for instance, incremental requirements for logging plans for roads and seismic surveys, operational restrictions in riparian management zones, and added requirements for access roads.

**Table 9: Estimated Impacts on Potential Gas Reserves in the Plan Area**

Catchment Area	TSR Regime (Pre-FPC)	Base Case (FPC & PAS)	Land Use Plan (Mgt. Strategies)	Cumulative Impacts
Estimated Remaining Reserves (Trillion cubic feet)				
South Foothills	13.4	12.5	11.2	11.2
Deep Basin	6.3	6.1	6.0	6.0
North Foothills	0.6	0.6	0.5	0.5
Fort St. John	1.3	1.2	1.2	1.2
Total	21.6	20.4 (-6%)	19.0 (-6%)	19.0 (-12%)

Source: Ministry of Energy and Mines

**Table 10: Estimated Impacts of Land Use Plan Management Strategies by RMZ**

Resource Management Zone	Total Natural Gas Potential Volume	% Net-Down due to Mgt. Strategies	Estimated Remaining Available Volume
Major River Corridors RMZ	1.2 Tcf	0%	1.2 Tcf
South Peace RMZ	4.8 Tcf	0%	4.8 Tcf
Agriculture/Settlement RMZ	2.1 Tcf	0%	2.1 Tcf
Grazing Reserves RMZ	0.3 Tcf	0%	0.3 Tcf
Plateau RMZ	2.3 Tcf	0%	2.3 Tcf
Alberta Plateau RMZ	3.1 Tcf	4% - 12%	3.0 Tcf
Foothills RMZ	3.1 Tcf	4% - 16%	2.8 Tcf
Special RMZs	1.4 Tcf	16% - 24%	1.1 Tcf
East Slopes RMZ	2.7 Tcf	28%	1.9 Tcf
Proposed Protected Areas	0.6 Tcf	100%	0 Tcf
Total (pre-FPC)	21.6 Tcf		19.6
Total (less 3% FPC)	21 Tcf		19 Tcf

Source: Ministry of Energy and Mines

With respect to the Land Use Plan, MEM reviewed management strategies for each RMZ relative to how exploration and development activities might be affected. A key consideration was the degree to which the management emphasis would restrict the ability to explore and develop new gas supplies. Where there was no perceived increase in access restrictions relative to the Base Case

(i.e., beyond FPC regulations), there was no estimated “net down” applied to potential reserves attributed. MEM examined all RMZs to judge whether potential gas reserves are likely to be impacted, and concluded that only strategies in the Wildlife Habitat/Wilderness Recreation, Wildlife/Coalfield, East Slopes, Alberta Plateau, and Foothills RMZs would result in “net-downs” to potential gas reserves,<sup>17</sup> as shown in Table 10.

The Plan also recommends directional drilling (i.e., drilling under Protected Areas from outside of the park’s surface boundary) be permitted under the Peace River/Boudreau Lake “Goal 1” and under the Kiskatinaw River and Klin-se-za “Goal 2” proposed Protected Areas (p. 135). While this strategy may simply allow for more complete extraction of proven reserves, if it allows increased access to potential reserves, a small portion of the 0.6 Tcf in Protected Area gas impacts noted in Tables 9 and 10 would be mitigated.

### 4.3 Tenures, Wells, Pipelines

Impacts on existing infrastructure are minimal - only 11 (1%) of all oil and gas wells and 55 km (3%) of all pipelines would be in new Protected Areas vs. the TSR regime.

As for tenures, there are about 1,217,000 ha. of oil/gas tenured land in the Plan Area, of which only about 5% is considered to be in “special management” under the TSR regime. In both the Base Case and the Plan, just over 1% are in or partly in proposed Protected Areas and approximately 38% are in the Special, Alberta Plateau, or East Slopes RMZs. While there may be some cost implications for development and possibly some compensation issues due to some of the strategies in these zones, this situation is not likely to result in any significant impacts in relation to the size of the overall industry in the Plan Area.

**Table 11: Petroleum Tenures within Proposed Protected Areas**

Proposed Protected Area	Goal 1 or 2 PA	Number of Active Tenures	% of Proposed PA Covered by Tenures
Butler Ridge (6822 ha.)	1	8 tenures	12%
Bearhole Lake (18,257 ha.)	1	2 tenures	3.5%
Elephant Ridge (22,641 ha.)	1	2 tenures	0.2%
Peace River/Boudreau (18,516 ha.)	1	47 tenures	28%
Kiskatinaw (165 ha.)	2	3 tenures	30%
Klin-se-za (2,359 ha.)	2	1 tenure	100%
Peace Corridor River Sites (302 ha.)	2	2 tenures	1%

Source: Ministry of Energy and Mines.

<sup>17</sup> Subsequent to the MEM analysis, the Twin Sisters RMZ was added as a Special Management Zone, which may have additional (but overall, relatively minor) implications for netting down gas potential.

The 65 tenures in conflict with new Protected Areas represents less than 4% of the 1746 tenures in the Plan Area; 47 of these tenures lay wholly or partly within the proposed Peace River-Boudreau Lake Protected Area. The Plan appears (the wording is somewhat unclear) to recommend that all oil and gas tenures be grand-fathered in new Protected Areas (i.e., that development be allowed to proceed) with the area reverting to park once the activity is completed (p. 133). As a result, compensation for these tenures is not expected to be an issue.

#### 4.4 Coal Bed Methane<sup>18</sup>

As organic matter is transformed into coal, "coal bed methane" (CBM) is sometimes retained.. Favourable conditions have been encountered in the San Juan Coal Basin in US, where CBM production accounts for 5% of total US natural gas consumption.

The coal of Northeast BC has the characteristics that indicate significant CBM potential. A recent estimate put the potential resource at 63 Tcf, or 78% of the provincial CBM total, which may even exceed the size of the conventional natural gas resource. However, the technical and economic feasibility of developing this resource potential in Northeast BC has yet to be proven. In 1996, Phillips Petroleum Canada, which has also been working in the San Juan Basin, tested the resource in a location south of the Quintette coal mine.

The production capability of the Northeast is thus unproven. The established gas transportation infrastructure is a positive element to support future development. Barring a major technological improvement in producing CBM, higher gas prices are required to stimulate industry interest in the resource potential. That is, long term well-head values in the \$3.00-\$4.00 per Mcf range are needed, which are at least double current prices.

At this time, there is not sufficient information to assess the implications of the Base Case and Plan on the potential for CBM. However, a key point is that it is an untapped resource that could more than mitigate the above impacts on the conventional gas resource (although there would still be some foregone opportunities) assuming world prices increase and/or technology improves at some point in the future.

#### 4.5 Hydro-Electricity

The W.A.C. Bennett Dam on the Peace River resulted in the creation of Williston Lake, BC Hydro's largest storage reservoir. There are two generating stations on the Peace, the G. M. Shrum and the Peace Canyon, having an operating labour force of approximately 150, and there remains undeveloped hydro-electric potential on the Peace River. A project to develop this potential has been designed by B.C. Hydro, which would involve construction of the "Site C" dam just downstream of the Moberly River and Peace River confluence near Taylor, but it has been in abeyance since 1981. The BC Assets & Land Corporation administers the flood reserves required for the Site C project, but development does not appear to be in BC Hydro's current plans.

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<sup>18</sup> Some information in this section was excerpted from B. Ryan, *Overview of the Coal and Coalbed Methane Resources of British Columbia*, BC Geological Survey Branch, 1996, or was provided verbally by Mr. Ryan.



In the Base Case, it is possible that a new Protected Area would preclude this project, given that such was recommended by the government's Regional Protected Areas Team and government policy does not normally allow hydro dams in Protected Areas. However, the Plan does not recommend that the proposed Peace River-Boudreau Lake Protected Area should preclude the Site C project (p. 131), which is consistent with the direction suggested by the Ft. St. John LRMP. BC Hydro staff indicate no other significant implications arising from the Land Use Plan.

#### **4.6 Socio-economic Implications of the Base Case & Land Use Plan on the Energy Sector**

Industry exploration and development activity is highly variable. While incremental provincial land use decisions affect the amount of Crown land available for exploration and development, the demand for energy in distant markets and other events external to the Plan Area are the most important influence the pace of development. Also, proven and potential natural gas reserves will support current production rates in Northeastern B.C. for another 50 - 100 years. Neither the Base Case nor the LRMP will cause the Plan Area to deplete reserves in the foreseeable future. Nevertheless, reductions in available potential reserves due to access restrictions and other management strategies will likely reduce exploration effort, production, employment and government revenues *over time and into the future vs. what they otherwise would have been.*

A simulation model of the North American gas market (the North American Regional Gas model, originally developed by Decision Focus Inc. of California) was used to forecast demand for B.C. gas. In 1995 Canadian Energy Research Institute (CERI) use this model to estimate the impact of removing Northeast BC lands from oil and natural gas development.<sup>19</sup> The simulation model sought to balance maximizing returns to gas producers and minimizing costs to energy consumers. The findings of the model were adapted for the LRMP impact assessment by identifying the volume of maximum potential reserves in the 4 basins underlying the Plan Area (i.e., Table 9: TSR Regime), estimating the timing of reserve additions and production from each basin, and then prorating the reduction in potential reserves estimated for the Base Case and the Plan. The resulting forecasts of gas production from the Dawson Creek Plan Area is illustrated in Figure 3.

Over time, as established reserves are depleted, new discoveries account for a growing proportion of supply. As smaller volumes of gas are discovered under the Base Case and Plan management regimes, the "gap" in production relative to the TSR regime widens over time. The model results also indicate that there is minimal foregone gas production (which is mainly coming from established reserves in existing fields not impacted) over at least the next decade and even with new Protected Areas, the FPC, and the Plan, gas production is still expected to increase substantially over the next 20 years, just somewhat more slowly than under the TSR regime.

Employment tends to be made up of many non-local persons, and most of the jobs are temporary or seasonal. MEM estimates that total resident/non-resident permanent/temporary upstream

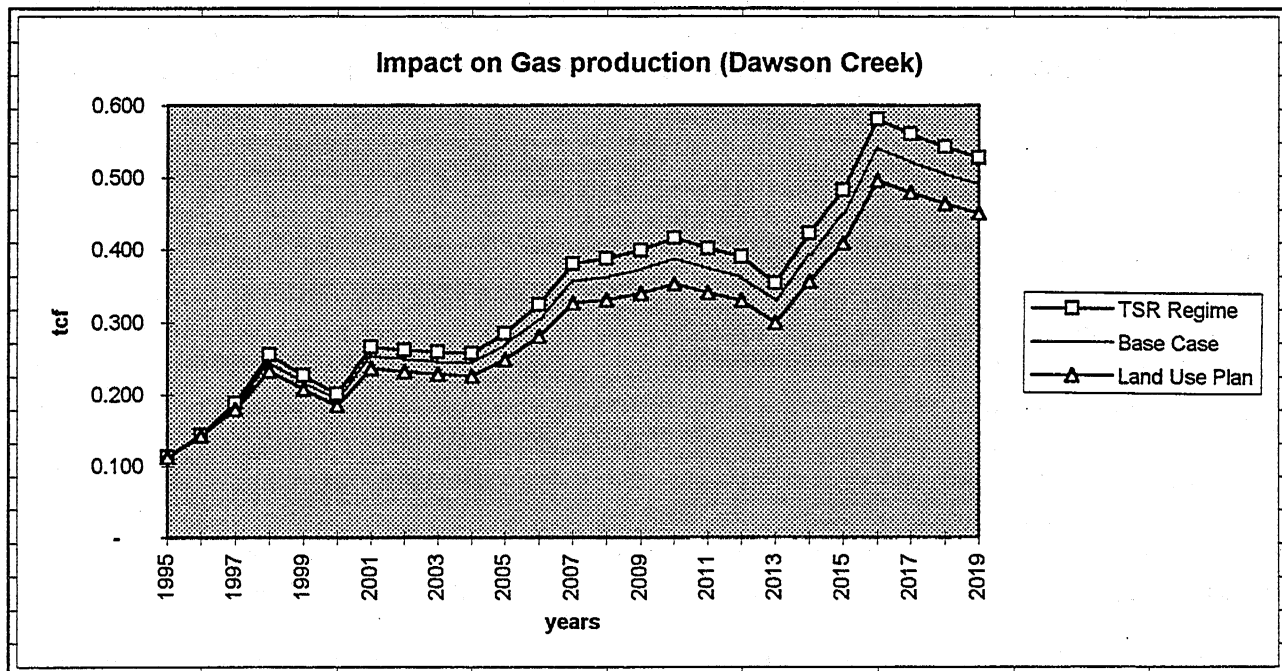
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<sup>19</sup> Canadian Energy Research Institute, *The Potential Impact of Land Use Restrictions of British Columbia's Natural Gas Supply*, September 1995.

employment in the Plan Area is about 1,100 persons. Of this, an estimated 330 (or 30%) are Plan Area residents, based upon B.C.'s share of industry exploration expenditures in the Peace Region.<sup>20</sup>

Under the TSR regime, the CERI model predicts an average of 1330 upstream jobs in the Plan Area over the next 20 years, and in fact estimates that the sector would reach about 2200 by the year 2016. Given the estimate of 30% permanent Plan Area residency, that implies a 20-year average employment level of 400. Assuming that this average is reduced proportionately by the amount of foregone available reserves, the Base Case employment level would be 376 and the Land Use Plan regime 20-year average employment would be 352 - note that both amounts are higher than estimated present employment, using very conservative assumptions.

**Figure 3: Estimated Impacts on Gas Production in Plan Area**



Sources: CERI and Robinson Consulting & Associates

Direct government revenue from the resource, in the form of land bonus payments and production royalties, is directly related to gas exploration and production, in addition to natural gas price. (The long term price forecast favoured by CERI was used here, which has the natural gas price staying relatively constant until early in the next century, and then rising at a rate greater than inflation.) For land bonus payment, the average payment over the past few years was adopted. The revenue will accrue to the provincial government in a stream of payments over the forecast period.

<sup>20</sup> According to the 1991 Census & Ministry of Finance Economic Dependency Analysis (see Dawson Creek LRMP Base Case, ARA Consulting, April 1996, pp. 1-5 to 1-7), at least some of these would be processing jobs, which are not considered to be sensitive to incremental land use changes over the 20 time horizon analyzed, given the expected continued growth in production. However, to compensate for growth in the sector since 1991, the 330 figure is used as a "best estimate."

For ease of comparison, the stream can be expressed as an equivalent present-day lump sum payment (using a 6% real discount rate) termed the "net present value equivalent." That is, total provincial government revenue over the 22 year forecast period is estimated to be equivalent to a lump sum payment today of about \$1.9 billion. Under the Base Case, the present value of the lump sum falls by \$98 million. This is equivalent to a sacrifice of annual revenues of about \$8 million for 20 years.<sup>21</sup> (Total revenues from the Plan Area were \$67 million in 1994.) The Plan further reduces the lump sum by about \$140 million, or an additional reduction in annual revenues of about \$12 million. Thus, the "opportunity cost" of the Base Case and Land Use Plan in terms of foregone gas revenues over the next 20 years is about \$20 million annually less than what they otherwise would be (not vs. today's amount.) This amounts to about \$15 per B.C. household annually, based upon 1.373 million households as of 1994. Table 12 summarizes the estimated foregone opportunities for tax revenues and employment.

**Table 12: Estimated Employment and Government Revenue Implications for the Dawson Creek Plan Area on a 20-Year Average Basis**

	TSR Regime (Pre-FPC)	Base Case Regime		Land Use Plan Regime	Cumulative Result
		PAS	FPC		
<b>Total Estimated Potential Gas Volume (Trillion cubic feet)</b>	21.6	21 (-3%)	20.4 (-3%)	19.0 (-6%)	19.0 (-12%)
<b>Average Total Resident Exploration/Extraction Jobs over 20 yrs. (1996 Jobs = ~330*)</b>	400	388 (-3%)	376 (-3%)	352 (-6%)	352 (-12%)
<b>Average Annual Resource Revenue Cost in \$ millions (1994 Revenues = \$67 million)</b>	0	\$8 mill.		\$12 mill.	\$20 mill.
<b>Annual Revenue Cost per B.C. Household (Dollars)</b>	0	\$6		\$9	\$15

Sources: MEM, CERI, Ft. St. John LRMP Base Case Report (ARA Consulting, March 1996), and Robinson Consulting & Associates

Finally, given the LRMP's wording associated with its Peace Boudreau Protected Area proposal (including the statement that a recommendation on any future Site C hydro-electric project is not within the scope of the LRMP), no jobs or other economic benefits related to a this potential facility should be sacrificed due to any of the provisions of the Land Use Plan.

<sup>21</sup> In other words, having a lump sum of \$98 million today and earning 6% interest for 20 years is equivalent to receiving an annual payment of about \$8 million for 20 years.

## 5.0 Coal/Minerals

### 5.1 Background

Coal resources dominate the Plan Area's mining sector, and mining for this fossil fuel accounts for almost 20% of the Plan Area economy. The workforce, most of whom reside in Tumbler Ridge, was recently down-sized at the Quintette and Bullmoose operations from about 1,300 to under 1,000 individuals. Employment may decline further due to weak world coal markets and the fact that the current coal contracts for Quintette and Bullmoose are due to expire in 2003. There are also 100-200 jobs associated with industrial minerals and/or mineral exploration, located mainly in Dawson Creek. The undeveloped coal potential is significant, and it is estimated that there are over a billion tonnes of measured reserves<sup>22</sup> (G.G. Smith, *Coal Reserves of Canada*, 1989) in the Plan Area and the most recent estimate of coal tenured land is 99,482 hectares or 3% of the Plan Area

### 5.2 Coal

No existing or proposed coal mines would be alienated by new Protected Areas in the Base Case or by the Plan. And the Plan states that mining is acceptable outside of Protected Areas (p. 24).

Under the TSR Regime, only about 2% of these High Potential lands and 6% of Coal Tenures are in some sort of Special RMZ. In the Base Case and Plan, less than 0.5% of High Potential Coal<sup>23</sup> lands (situated primarily in a coal bearing trend running along from Saxon in the south, through the communities of Tumbler Ridge, Chetwynd to Seven Mile Creek and Mt. Gething in the north) are in proposed Protected Areas, and 35% are in either Special RMZs or the East Slopes RMZ, where access restrictions are more stringent (virtually none is in the Alberta Plateau RMZ.) As for Coal tenures, a maximum of 0.7% are in proposed Protected Areas, and 13% lay within the Special and East Slopes RMZs Table 13 highlights the key areal implications due to the Land Use Plan.

**Table 13: Allocation of Coal Potential Lands**

Coal Potential Rating	Total Land Base		Distribution of Coal Potential Lands among RMZs			
	Hectares	% of Plan Area	Special, East Slopes, Alberta Plateau	Multi-Value	Enhanced	PAs
High	92,042	3%	35 %	55 %	9 %	0.3 %
Medium	1,389,290	5%	36%	25%	37 %	1.4 %
Coal Tenures	99,482	3%	16%	63 %	21 %	0.7%

<sup>22</sup> Coal resources are classified into an hierarchy of "Measured," "Indicated," and "Inferred" Resources, with the former being that portion of the estimated resource that has the highest probability of being economic to mine at some point in the future. For purposes of comparison, the Quintette property has 90 to 150 million tonnes of measured reserves, and considerably more indicated/inferred reserves.

<sup>23</sup> Coal potential work by A. Legun, *Coal Potential of the Peace River Coalfield*, BC Geological Survey Branch, July 1994.

It is apparent that very little of the known resource would be alienated outright and about 60% of High/Medium potential lands and 19 of 25 developed coal prospects remain in the relatively non-constraining Foothills, Plateau, and Enhanced RMZs. Of the remaining six, one (Coal Ridge) is in the Kakwa North proposed Protected Area, one (Saxon)<sup>24</sup> is in the Wildlife/Coalfield Special RMZ, three (Goodrich, Windfall, & Carbon Creek) are in the East Slopes RMZ, and one (Wapiti) is in the Alberta Plateau RMZ.

While there is no evidence that coal exploration and development activities would be reduced by the LRMP, costs are likely to increase in those lands (i.e. the approximately one-third of High and Moderate Potential Coal lands and the maximum 16% of tenured land in the Wildlife/Recreation, Wildlife/Coalfield, Alberta Plateau, and East Slopes RMZs subject to the somewhat more constraining "Sensitive Access Management."

### 5.3 Metallic and Industrial Minerals

There are no metallic or industrial mines presently operating in the Plan Area but there are some intermittent placer operations. Exploration expenditures for these minerals are not large. Only 820 hectares (0.02% of the Plan Area) is presently under tenure for metallic or industrial mineral exploration activities

Similar to the exercise undertaken for coal, MEM undertook mineral potential mapping for metallic and industrial minerals. For the metallic mineral resource, the assessment indicates that there is about 26,000 ha. of High Potential lands (1% of the Plan Area), concentrated in two areas along the western boundary. High Industrial Mineral Potential was identified on 129,000 hectares (4% of the Plan Area) and Medium Potential on 167,000 hectares (6% of the Plan Area), located within a 15-45 km strip also along the western boundary of the Plan Area.

Under the TSR regime, 94% of High Metallic Potential lands and 95% of High Industrial Potential areas would be located in Enhanced RMZs. In addition, 78% of the tenured areas would be found in these zones. In the Base Case and Plan, the results of the area analysis for these mineral values are identical. It is apparent from Table 14 that there are virtually no implications from Protected Areas, but significant amounts of High Metallic and Industrial Potential, as well as tenures, are located in zones with relatively high access restrictions. In fact, 94% of High Metallic Potential lands are in the East Slopes RMZ, as are 75% of tenures. This may have some negative implications for future exploration, however the limited inventory suggests the area is quite under-explored and thus at least some activity could be diverted to the less constraining RMZs.

A short term consideration is that in the latter stages of the LRMP process, claims for a phosphate resource were staked over about 30% of the proposed 16,500 ha. Wapiti Lake Protected Area. Because the Land Use Plan does not recommend grand-fathering of these tenures, alienation under current PAS policy is implied along with a compensation/negotiation issue for government.

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<sup>24</sup> Subject to access/infrastructure considerations, the Saxon deposit appears quite promising and has a measured "run of mine" resource of 70 million tonnes, according to the proponent.

**Table 14: Allocation of Metallic/Industrial Mineral Potential Lands by RMZ Category**

Mineral Potential Rating	Total Land Base		Distribution of Metallic/Industrial Mineral Potential Lands in Base Case and Land Use Plan			
	Hectares	% of Plan Area	Special, East Slopes, & Alberta Plateau RMZs	Multi-Value RMZs	Enhanced RMZs	PAs
High Metallic	26,186	1%	100%	0%	0%	0%
High Industrial	1,389,290	4%	59%	26%	0%	15%
Mineral Tenured Area	820	0.02%	97%	0%	3%	0%

#### 5.4 Socio-Economic Implications of the Base Case & Land Use Plan for Coal/Minerals

Niether Base Case government initiatives nor the Land Use Plan cause any significant impacts to current operating mines or mining-related jobs in the Plan - it is future potential opportunities that may be foregone or prove more costly to develop. As for coal specifically, only marginal amounts of identified High Potential Mineral and Coal lands conflict with proposed protected areas, as does no more than one proven deposit. In reality, probably the most significant issue currently facing the Plan Area's coal sector is the uncertainty facing the Quintette and Teck mines.<sup>25</sup>

Three technical reasons which make it difficult to predict socio-economic implications of the Base Case and Plan for this sector involve the highly imperfect knowledge<sup>26</sup> about the probability and timing of potential future mines in the Base Case, primarily because:

- coal market demand conditions for are volatile, and world prices have been quite low for years
- the large cost of starting a new mine poses huge risks to bringing more production on stream
- evaluation of the economically viable extent of the coal resource is also made difficult due to the varying qualities (i.e., amount of ash, distance from service, amount of over-burden, etc.) of these "laterally extensive" deposits

However, estimates of coal resource tonnages are available (see Table 15), as are employment estimates for existing mines, which can be used to go beyond the areal analysis and provide some

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<sup>25</sup> An additional "Base Case" development since the March 1997 assessment is that the northeast coal contract negotiations with the Japanese have resulted in an agreement. While this appears to imply short term stability, it is noteworthy that the *International Coal Report* (May 19, 1997; Issue 424) states that Teck corporation has indicated that it will cease operating both mines by the year 2003.

<sup>26</sup> This situation contrasts that of the oil/gas resource, where proven/potential reserves (that would eventually be economic to extract) can be assessed with more confidence. Moreover, petroleum resources have a fairly stable/predictable market demand and supply relationship, and the capital costs of bringing on incremental volumes are not nearly the magnitude of those associated with developing new coal mines.

information about the socio-economic significance of potential new coal mines in the area. From this information, one can infer the possible opportunity costs of any preclusion of development, even though the probability of outright preclusion is low outside of Protected Areas.

Table 15 indicates that there are approximately 1 billion tonnes of "Measured Coal Resources" in the Plan Area, contained in coalfields 2 through 12 as shown in the diagram in Appendix II. Using the Measured Resource figures (for purposes of conservatism) as a guide, and noting the size of the developed Quintette resource, it is apparent that there is currently at least enough coal to eventually establish the equivalent of 6-10 operations the size of the Quintette mine and its associated employment of almost 1000 workers.<sup>27</sup> Note these would occur only gradually (some may never occur) since developments are highly dependent on world markets and a variety of cost factors.

**Table 15: Coal Resources in the Dawson Creek Plan Area: 1989 Estimates**

Coalfield	Number (Map)	Measured	Indicated	Inferred
		Million Tonnes		
Butler Ridge	2	-	-	450
Peace River	3	10	70	510
Carbon Creek	4	50	30	35
Pine River	5	65	125	395
Bullmoose/Sukunka	6	245	155	370
Mt. Spieker	7	30	5	85
Quintette	8	150	50	2100
Monkman	9	400	800	1480
Belcourt E & W	10 & 11	40*	800	220
Saxon	12	25*	250	250
<b>Total</b>		<b>1,015</b>	<b>2,285</b>	<b>5,895</b>

Source: G.G. Smith, *Coal Resources of Canada*, Paper 89-4 for the Geological Survey of Canada, 1989.

\* MEM MINFILE estimate is higher for Belcourt (123 million tonnes of measured resource) and the tenure-holder indicates that revised Saxon estimate is also higher (70 million "run-of-mine" tonnes)

<sup>27</sup> It now appears that the stock of reserves that are being mined at Quintette will be in the order of 90 million tonnes, of which about two-thirds have now been extracted. 1996 employment for Quintette estimated at 952, according to the Ministry of Energy and Mines.



Of concern to the coal sector is the Narraway River Special RMZ (Wildlife/Coalfield), its more promising coal potential, e.g. portions of the Belcourt tenures and the Saxon property, and its relatively more constraining access management strategies vs. the Base Case.<sup>28</sup> In fact, coal tenures exist in five separate blocks that extend from the Torrens River northwest to Holtslander Creek.

As shown by the map in Appendix H of the June 1998 LRMP document, most of the Saxon tenures are within this RMZ while the Belcourt tenures (which are closer to transportation infrastructure) straddle this RMZ and the East Slopes RMZ, the latter zone having only somewhat less constraining management strategies. According to MEM, the measured reserves for the Belcourt properties are currently estimated at 123 million tonnes (on the scale of the Quintette mine) and the proponent's estimate for Saxon is about 70 million ("run-of-mine") tonnes. In addition to these two properties, there is another property (Secus) in the central portion of the Wildlife/Coalfield RMZ that may hold promise. Note also that small portions of the Saxon tenures (about 120 ha.) and three other properties (Hanington, Torrens River, and Coal Ridge) lay within the proposed 31,000 ha. Kakwa North Protected Area, adjacent to the Wildlife/Coalfield Special RMZ.

Therefore due to the large amount of the resource that remains available outside of proposed Protected Areas, impacts from outright alienation are minimal. However, the LRMP does contain strategies likely to increase exploration and development costs in some zones, primarily in the Wildlife/Coalfield and East Slopes RMZs, where access is more constrained and significant coal potential exists. This could also have an adverse effect on investor confidence, at least until experience is gained with the new LRMP management regime. That being said, the impetus for developing new projects in the Plan Area is largely driven by events in world mineral market.

## **6.0 Tourism, Guide-Outfitting, and Recreation**

### **6.1 Background**

The Plan Area offers a variety of both "front-country" and "back-country" tourism and recreation opportunities. As of 1991, tourism employed 750-800 workers (primarily in front-country occupations, i.e. accommodation and food services, many of which rely heavily on business travellers) and accounted for up to 8% of the local economy. While front-country tourism is important, it is less likely to be impacted by incremental changes in crown land use than is the back-country component. This is because this latter segment of the industry is more "nature-based," and therefore is more strongly linked to the management regimes on Crown land. These kind of commercial and non-commercial outdoor wilderness activities include hunting, scenic/wildlife viewing, jet-boating, fishing, ATVing, snowmobiling, hiking, kayaking, mountain-biking, cross-country skiing, and caving. It is thus the effects of the LRMP and other initiatives on back-country tourism and wilderness recreation in the Plan Area that are the primary concern of this assessment.

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<sup>28</sup> After consultation with MEM staff, it was decided that no defensible way of assessing the potential costs of complying with the access or other management strategies was possible, mainly because of the broad nature of the strategies and that so much would depend on the specific location and particular environmental values which would have to be addressed for any new coal mine. However, since any proposed coal mine with a production capacity of at least 250,000 tonnes annually has to be reviewed under the provincial Environmental Assessment Act as part of the Base Case, the added costs to mitigate environmental concerns may be marginal in some cases.

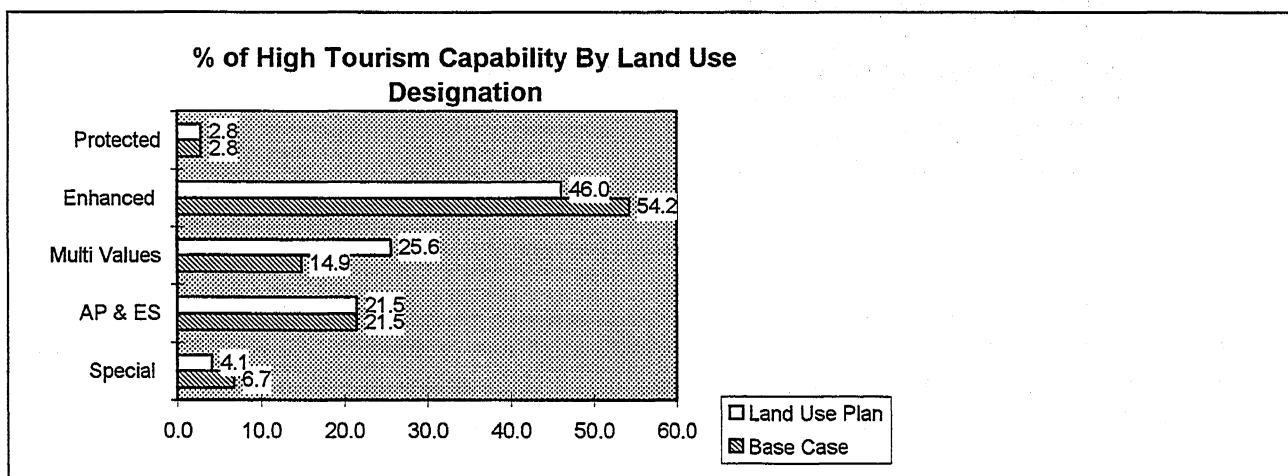
## 6.2 Tourism Capability

Recently a Tourism Resource Inventory was undertaken for the Northeast region of B.C.<sup>29</sup> This capability mapping combines those resources which are important to a range of tourism activities and develops a rating of High, Moderate and Low capability of the land base to support tourism use and development. (This mapping does not incorporate the existing use by other resource sectors and only considers the resource base from a tourism perspective, similar in concept to the capability mapping for energy, minerals, ALR, etc.) The capability mapping covers the entire Plan Area and the results by capability category were as follows:

- 34% of the Plan Area - High capability for tourism
- 42% of the Plan Area - Moderate capability for tourism
- 24% of the Plan Area - Low capability for tourism

Figure 4 illustrates the distribution of the High Capability lands by RMZ designation. Both the Base Case and Plan improve upon the TSR regime in terms of managing for nature-based tourism values. In the Base Case, 54% of High Capability lands fall in Enhanced RMZs, in which the impacts of the extractive resource sectors on the landscape would most adversely affect the more nature-based activities. The amount of High Capability lands within Enhanced RMZs decreases under the Plan to 46% due to a slight re-allocation to Multi-Value RMZ, resulting in some improvement over the Base Case. In both the Base Case and the Plan, about 25% falls within the most sensitively managed zones, i.e., Alberta Plateau, East Slopes, and the Special RMZs. The Plan also offers some supportive tourism/recreation strategies in the General Management Direction (p. 16) which apply to the entire Plan Area, and others are specified for many RMZs. Motorized recreation may be restricted in the Wildlife/Coalfield, East Slopes, and Twin Sisters RMZs, however (pp. 92, 121, & 130), which could also benefit back-country tourism.

**Figure 4: Allocation of High Capability Tourism Lands by RMZ Category**



<sup>29</sup> Julie Paul and Associates was retained by Ministry of Small Business, Tourism and Culture to undertake this work, which involved rating the Northeast area of BC for tourism capability based on various map overlays (e.g. wildlife/fish resources, scenic quality, water resources, existing tourism infrastructure, etc.) and consultation with area tourism businesses.

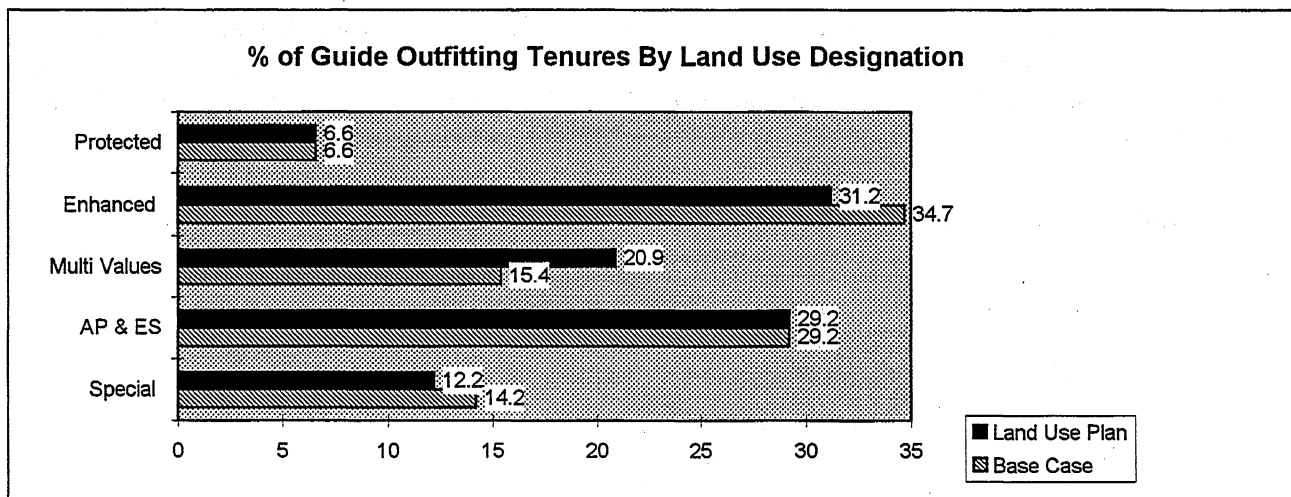
### 6.3 Guide-Outfitting

There are 11 Guide-Outfitting tenures over 2000 ha. wholly or partly within the Plan Area, covering approximately 93% of its Gross Land Base. The Plan has as an objective to sustain of existing Guide-Outfitting opportunities (p.21) and commercial guiding is deemed an allowable use (Appendix F, p. 192) in new Protected Areas, subject to the individual Protected Area Management Plan (PAMP). Permits will be required for access into the protected areas, which is consistent with current practices. Therefore until the PAMP's are in place it is unknown to exactly what extent guide outfitters will be limited in their current or future use within the proposed Protected Areas.

Under the TSR regime, 1.8% of the Guide-Outfitter territories fall within existing Protected Areas. Under the Base Case and Plan, this will increase to 6.6% of the total tenured area, protecting more pristine values than previously.

Of all the land use designations, the Enhanced RMZs are the primary concern with respect to Guide-Outfitting. While Guide-Outfitting is a recognized use within these zones, other resource users are the primary focus, which would likely reduce the longer term potential for guide outfitting in these areas. Under the TSR situation, about 92% of the tenures would remain in the equivalent of Enhanced RMZs, while both the Base Case and Plan reduce this to about 31% (20% in South Peace, 4% in Grazing Reserves and 7% in Agriculture/Settlement RMZs).

**Figure 5: Allocation of Guide-Outfitting Tenures by RMZ Category**



To obtain a better understanding of the overall implications of the Land Use Plan on Guide-Outfitting it is important to look at the 11 individual guide territories, since many are only marginally within the Plan Area. As noted in Table 16, half of the guide outfitters have over 100,000 ha of territory within the Plan Area, with only 2 having greater than 500,000 ha.

This Table also indicates to what degree each territory would lay within new parks or the relatively supportive Special, East Slopes, or Alberta Plateau RMZs. The key implication is that 7 of the guide outfitters have a portion of their territories falling within proposed Protected Areas, and 8 experience significant increases in portions of their territories that within RMZs with higher environmental constraints compared to the TSR regime. The difference in the area statistics between the Base Case and the Scenario were not significant for any of the territories, however.

Thus, due to new Protected Areas, some supportive management strategies, and reduced risks to fisheries and wildlife populations due to the FPC and other government initiatives, the situation for the guide-outfitting sector is improved when compared to what would otherwise prevail. However, over the long term, there is still likely to be some deterioration in wilderness attributes in the Plan Area which could place some businesses at risk.

**Table 16: Implications of RMZs for Guide-Outfitter Tenures within the Plan Area**

Tenure within Plan Area for each Guide (ha. & %)	% of Individual Tenure which falls within Protected Area		% of Individual Tenure which falls within Special, Alberta Plateau, and East Slopes RMZs	
	TSR Regime	Base Case & Plan	TSR Regime	Base Case & Plan
6241 (0.2%)	0%	15%	0%	85%
24163 (0.9%)	0%	0%	0%	1%
32262 (1.2%)	43%	47%	0%	51%
56031 (2.0%)	0	0	0%	26%
142750 (5.2%)	0	5%	9%	49%
279762 (10.1%)	3%	12%	11%	41%
314523 (11.4%)	0	10%	7%	54%
356218 (12.9%)	7%	7%	3%	49%
447253 (16.2%)	0	10%	0%	66%
531279 (19.2%)	0	0.2%	7%	7%
569483 (20.6%)	0	4%	10%	10%
<b>2,759,965 (100%)</b>	<b>1.8%</b>	<b>6.6%</b>	<b>6.1%</b>	<b>41%</b>

## 6.4 Recreation

The Plan Area supports local resident and visitor use of a range of summer and winter activities. The Land Use Plan offers some management strategies to support many of these, both motorized and non-motorized. For each RMZ there is a different emphasis on the range of recreation opportunities to be offered. The degree to which each of these management strategies impacts on current and potential recreation use is discussed below.

### 6.4.1 Recreation Opportunities Spectrum & Undeveloped Watersheds

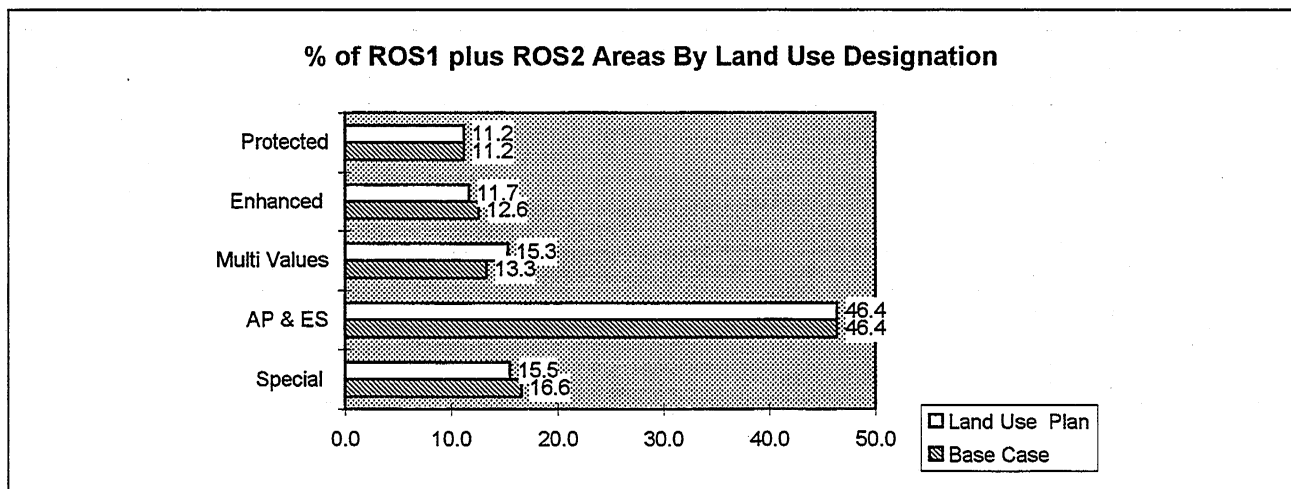
The Recreation Opportunities Spectrum (ROS) is a Ministry of Forests mapped inventory of the range of non-roaded and roaded recreational opportunities available to recreationists/tourists pursuing nature-based activities. The ROS divides the land base into the following categories:

- Primitive Non-Motorized (ROS 1): >8km from a 4-wheel drive road & >5000 ha.
- Semi-Primitive Non-Motorized (ROS 2): >1km from a 4-wheel drive road & >1000 ha.
- Semi-Primitive Motorized (ROS 3): >1km from a 2-wheel drive road & >1000 ha.
- Resource Roaded (ROS 4 & 5): the remaining land base, roaded and rural

The mix of ROS categories is important as then a range of activities can be accommodated. The most recent inventory of the Plan Area shows: Primitive (ROS 1) - 3%; Semi-Primitive Non-motorized (ROS 2) - 29%; Semi-Primitive Motorized (ROS 3) - 23%; Resource Roaded - 45%.

Under the TSR regime (in which 99% of ROS 1 & 2 occur in Enhanced RMZs) industrial activities would, over time, reduce the amount of lands classified as ROS 1-ROS 3. However, the emphasis of this assessment is on the ROS 1 and ROS 2 areas as they are most at risk, and given continued resource development, there is unlikely to be a shortage of roaded recreation opportunities. As shown by Figure 6, in the Base Case and the Plan, about 70% of ROS 1 & ROS 2 fall within RMZs which have higher restrictions for access resource management (i.e., Protected, the Special RMZs, East Slopes, , Alberta Plateau, and Major River Corridors, in approximately that order.

**Figure 6: Allocation of Primitive & Semi-Primitive Non-Motorized Areas by RMZ Category**



In the Base Case, only 11% of combined ROS 1/ROS 2 lands are in Protected Areas, implying that only this 11% (about 106,000 ha.) that would remain in about the same condition as it is presently. To attempt to mitigate some of the risks to the remaining ROS 1/ROS 2 (and also to ROS3) lands located outside of Protected Areas, the Plan specifies for all tenure holders that upon cessation of tenures, deactivation of non-seismic linear corridors<sup>30</sup> will occur in the Wildlife Habitat/Wilderness Recreation, Wildlife/Coalfield, East Slopes, and Twin Sisters RMZs (and some other RMZ sub-zones); this should slow down (but by no means halt) linear development in the Plan Area.

Another mapped indicator used to assess wilderness recreation values is the amount of "Undeveloped Watersheds > 5000 ha." contained in supportive RMZs. According to the MoF recreation inventory, there are 313,350 ha. (11% of the Plan Area) of such areas; only 12% is in existing parks under the TSR regime (with the rest in Enhanced RMZs), but both the Base Case and Plan place 32% in Protected Areas, with all but 5% of the remainder in Special RMZs and the East Slopes RMZ, which are the areas with the highest access restrictions.

<sup>30</sup> In spite of road deactivation efforts, there are those who believe there is a high risk that once an area has become roaded, it can never return to a non-roaded or unaccessed state.

Thus with 89% of ROS 1/ROS 2 lands and 68% of Undeveloped Watersheds > 5000 ha. outside of Protected Areas, even though the Plan should retain more “wilderness” than the Base Case, the amount of such areas is still expected to decline into the foreseeable future, and with it at least some of the more nature-based recreation opportunities.

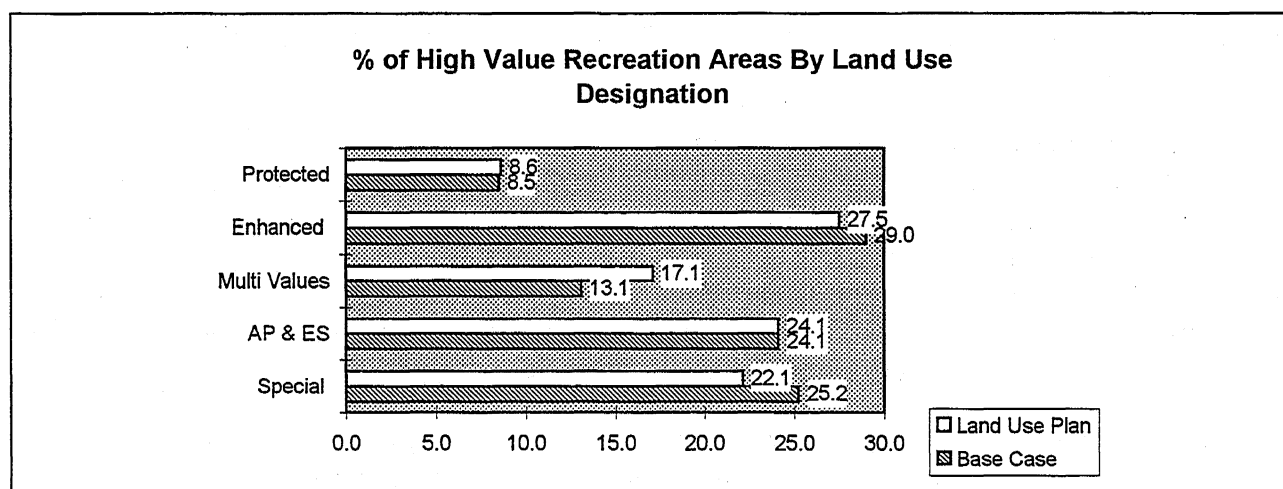
#### 6.4.2 Recreational Areas

The Ministry of Forests also has a “Management Class Inventory” with two classes:

- Outstanding (Class 0): areas of outstanding recreational, educational, scientific, or heritage value and are more appropriately managed for recreational values
- Specially Managed (Class 1): areas needing special management to maintain recreation values

Both of these categories are based on the type of recreational activities offered and the presence of high value recreational assets. In total, 42% of the Plan Area contains these areas. Figure 7 illustrates that there is little difference between the Base Case and the Plan according to distribution by RMZ category, with about 9% in Protected Areas and 50% in the Special, Alberta Plateau, and East Slopes RMZs. However, the Plan offers some additional measures over and above the Base Case to manage for these areas and features within the General Management Direction (p. 16)

**Figure 7: Allocation of High Value Recreation Areas by RMZ Category**



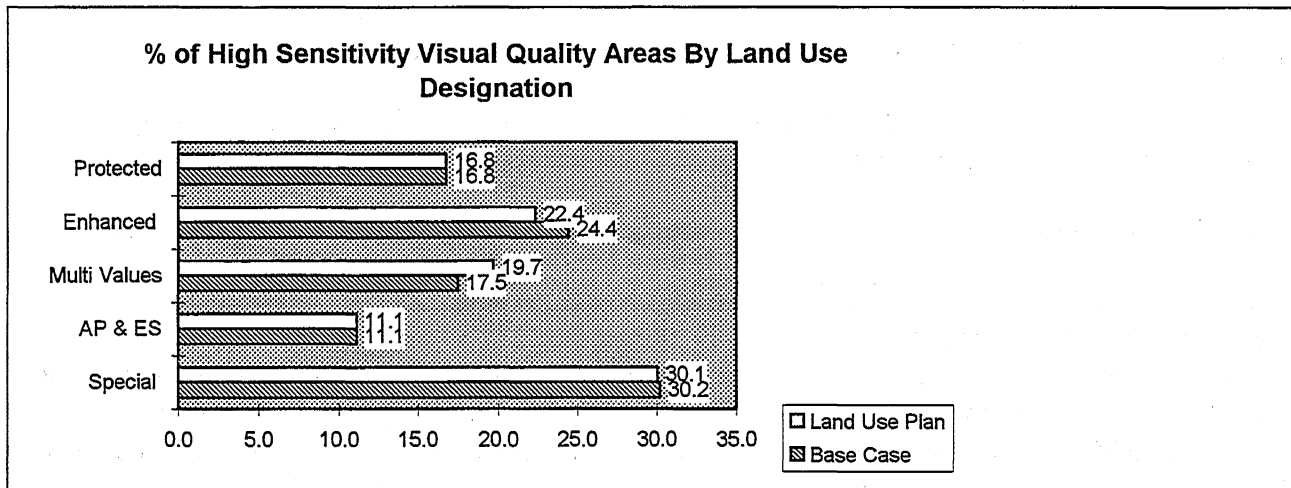
#### 6.5 Visual Quality

The Land Use Plan recognizes that scenic landscapes are valuable to the aesthetic integrity of the Plan Area. Scenic areas are important from a tourism and recreation perspective as well as from a community perspective. The General Management Direction has as an objective to “manage” scenic values in visually sensitive areas, mainly through the development and application of new VQOs (p. 17). However, no details are provided as to where or how stringent such VQOs will be.

There are currently 137,132 ha (5% of the Plan Area) identified as being of Highly Sensitive visual quality. Under the TSR regime, only about 26% of these areas are located in specially managed corridors. As shown in Figure 8, in the Base Case and Plan, 17% is in Protected Areas and an additional 41% is in either Special, East Slopes, or Alberta Plateau RMZs, but note that there are

no additional objectives/strategies for visual management for these RMZs. Thus the Land Use Plan should result in lower visual impacts from resource development than would the Base Case, but visual quality will likely continue to deteriorate as extractive resource activities proceed over time.

**Figure 8: Allocation of Highly Sensitive Visual Quality Areas by RMZ Category**



## 6.6 Socio-Economic Implications of Base Case & Land Use Plan for Tourism/Recreation

There will be little noticeable impact on front-country tourism or on roaded recreation opportunities (which will likely increase over time) as a result of the either Base Case initiatives (i.e. FPC, PAS, etc.) or the Plan. However, the Plan improves upon the Base Case for both back-country tourism (including guide outfitting) and recreation values. The new Protected Areas provide wilderness settings in key parts of the region, and the specific management regimes within the Special, Alberta Plateau, and East Slopes RMZs provide some important access restrictions and linear corridor deactivation measures. For outdoor/wilderness related tourism operations like guide-outfitters, the short/medium term benefits will likely be positive relative to the Base Case.

With respect to the expansion and development of tourism operations, the 5.1% of the Plan Area in new Protected Areas is the only designation which restricts development, although tourism development at a small scale level is an allowed use within protected areas (cabins, huts, etc) subject to PAMPs (p. 193). The RMZs which border the Protected Areas allow tourism development and in most cases the key fish/wildlife resources important to tourism within these RMZs will be managed more sensitively than under the Base Case.

However, in the long term, as development and roads proceed throughout the 93% of the Plan Area not protected, and depending partly on the success of road deactivation and other access management efforts, key backcountry tourism/recreation values are still likely to be compromised. Such a trend would increase the commercial risk to nature-based businesses over time.

## **7.0 Trapping**

Trapping is a traditional resource use within the Plan Area. The fur-bearer populations of marten, fisher, lynx, coyote, wolf, fox, beaver, and other species are commercially harvested by 83 registered trapping areas or portions of areas within the Plan Area, many held by First Nations.

Although the historic trends in the early 1990's have shown that the trapping sector was undergoing a decline, 1996 statistics indicate a resurgence in market demand and prices for furs. Market growth is being exhibited throughout the world markets including Europe, and the Orient, and Russia is now entering the market place.

Trapping is a recognized use in the Plan, and a General Management Direction objective for this sector is to provide long-term trapping opportunities (p. 20), including maintenance of "full rights" in new Protected Areas (p. 136). But the trapping industry is obviously dependent on the fur-bearer populations. Management of critical fur-bearer habitat is specified in the General Management Direction, primarily for marten, fisher, and lynx (p. 20). The Plan also includes supportive fur-bearer habitat management strategies in the Major River Corridors, South Peace, Multi-Value, Grazing Reserves, Alberta Plateau, East Slopes, and Twin Sisters RMZs. (pp. 52, 61, 69, 77, 103, 111, 117, & 125) which covers over 80% of the Plan Area. However, the environmental assessment (see Section 9) concludes that even with these strategies, marten populations are likely to fall over the next 50-100 years as mature coniferous forests are harvested.

No mapped fisher habitat was available for this assessment, but in Base Case it is likely that this species will continue to decline in population, in part due to losses in habitat and possibly also due to excessive trapping activity (the latter is exacerbated by new access.) The management strategies outlined in the Plan may reduce the rate of decline, especially in the Major River Corridors RMZ where important habitat is believed to exist. Such trends may lead to losses in trapping income from these species over time, although world prices and market demand will also be factors.

## **8.0 Communities and First Nations Implications**

Overall, the Dawson Creek Plan Area is one of the more economically diversified resource-based regions in the province, given the relative balance among the five key industrial sectors: Mining, Forestry, Agriculture, Energy, and Tourism. Public sector employment and non-employment income also bring in about 36% of all personal income, lending more stability to the Plan Area.

The communities with the highest populations are Dawson Creek, Tumbler Ridge, Chetwynd, and Hudson's Hope. According to the Ministry of Finance and Corporate Relations' Economic Dependency Analysis, Dawson Creek and Hudson's Hope have the most diversified economies. The leading industry in Dawson Creek is forestry, which accounts for about 9% of the economy, while in Hudson's Hope, the key economic drivers are the public sector at 14% of the economy and the non-resource sectors at 42% (mainly utilities, i.e. B.C. Hydro, and construction). About 76% of the Tumbler Ridge economy is driven by the coal mines while Chetwynd is one of the more forestry dependent communities in the entire province (although the pulp mill provides some diversification) with 30% of its economy being forestry-dependent.



Since there are no losses in existing jobs associated with either the Base Case or the Plan,<sup>31</sup> the issue of economic diversification is less of a concern in the Dawson Creek Plan Area than it is for many southern BC communities that are facing much more severe constraints in resource availability (i.e., timber). One exception, as noted in the Forestry discussion, is the expected "fall-down" in the allowable deciduous harvest likely to occur during the latter stages of the next 30 years. Even then, this would only have employment implications if the licensee (for Dawson Creek OSB mill and Chetwynd pulp mill) cannot secure adequate fibre supplies from private lands, etc. Given its low level of economic diversification, the economic stability of the community of Chetwynd would be most affected by any significant future curtailment in operations.

The three aboriginal communities in the Plan Area are the Kelly Lake Metis, West Moberly, and Salteau Lake First Nations. These individuals number 600-700 on reserve, with several hundred also living off-reserve. The Plan's implications for aboriginals are difficult to assess since their participation in the LRMP process was infrequent and no mapping of their values was available.

However, the Plan attempts to address First Nations interests by including a number of supportive objectives and strategies, including avoidance of unjustifiable infringement of aboriginal and treaty rights, enhancing aboriginal participation in future resource planning, conservation of cultural/heritage resources (pp. 17-19). It also specifies continuation of First Nations use of proposed Protected Areas for sustenance and other traditional activities, subject to conservation objectives (p. 37). In addition, the proposed Protected Areas and RMZs slated for more sensitive management regimes will better preserve key aboriginal values (e.g., fish/wildlife, cultural resources, etc.) than otherwise would occur. For example, there are important First Nations cultural values in the Klin-se-za, Butler Ridge, Pine-Lemoray, and Peace River-Boudreau Lake (Goal 1) proposed Protected Areas. Finally, the Land Use Plan states that First Nations will be encouraged to participate in the implementation/monitoring of the Plan, and that the LRMP will be without prejudice to aboriginal and treaty rights (p. 140).

A key aspect of the Plan, designed to address some specific environmental and cultural concerns of the West Moberly and Salteau First Nations, is the establishment of the Twin Sisters Special Management RMZ, which surrounds the Klin-se-za proposed Protected Area. (The Salteau specifically have indicated the spiritual importance of this area, as well the plant, food, water, mineral lick, fishery, and wildlife resources they consider to be highly significant; they also have expressed concerns about the adverse impacts of resource development on these values.) To address these concerns for this area, the Plan proposes a Biodiversity Emphasis Option of "Intermediate-to-High," numerous strategies to conserve fish and wildlife values, restriction of recreation activities, minimization of new access development, maintenance of spiritual values along traditional access corridors, and recommends that First Nations and development interests are to engage in cooperative planning (pp. 125-130).

Therefore the Land Use Plan should better preserve values important to the Salteau and other First Nations in the Plan Area, although such values may still be at risk over the longer term.

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<sup>31</sup> Some jobs may actually be created due to increased tourism associated with the new Protected Areas, e.g., in Hudson's Hope due to the close proximity of the proposed Butler Ridge and Peace River Boudreau Protected Areas and their high recreational values. Such jobs would only be created gradually over time, however.

## 9.0 Environmental Assessment

### 9.1 Introduction

The purpose of this resource analysis is to provide an assessment of the environmental (biodiversity/wildlife) consequences or risks associated with both the Base Case and the proposed Land Use Plan. In order to assess the potential effects of the Plan, as in the socio-economic portion of the assessment, resource values have been compared to two alternative benchmarks: (1) the pre-FPC land use regime which considers only the *Dawson Creek TSA Timber Supply Review (1994)*; and (2) the (projected) Base Case, which includes the TSR, the subsequent Chief Forester's *AAC Rationale (1996)*, as well as all FPC regulations, implications of FPC guidebooks (e.g., Biodiversity Guidebook) and those *Protected Areas (PAs)* identified by the Dawson Creek LRMP Table, since the foregoing initiatives would occur (in some fashion) in the absence of the LRMP.

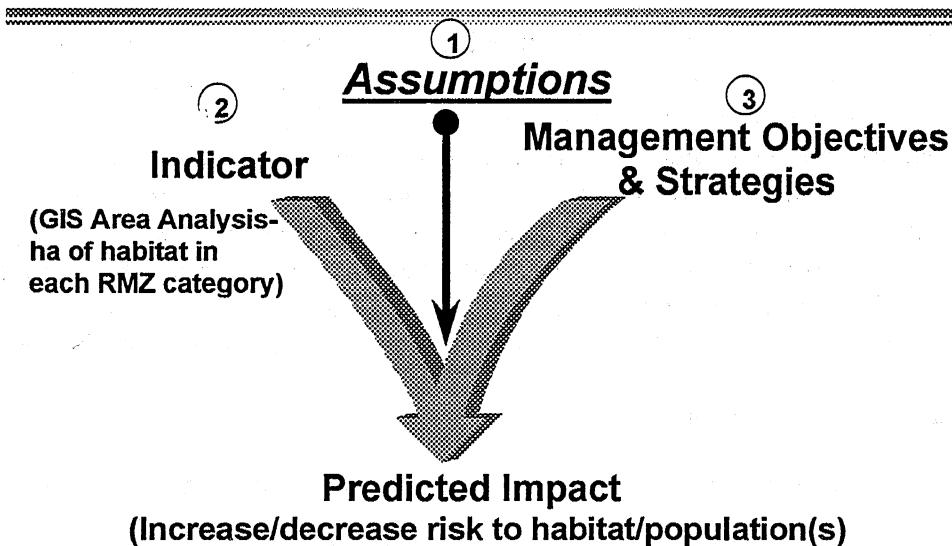
### 9.2 Methods (Indicators, Assumptions)

Two primary sources of information were used to determine potential environmental impacts:

- (1) *GIS area statistics for each indicator*. The Geographic Information System (GIS) area analysis provided the areal breakdown of wildlife habitat in each RMZ category and in the collective Protected Areas. For this final report, two area analyses were used: the area summaries for the (larger) RMZs as per the Plan, well as the landscape unit biodiversity analysis (August 1997). Wildlife capability maps for caribou, mountain sheep, elk, mountain goat, grizzly bear, marten and wood warblers were provided by BC Environment.
- (2) *Management Objectives and Strategies* - as per the the Dawson Creek LRMP recommendations. The management objectives and strategies outlined for each RMZ were used to determine the potential implications for wildlife habitat by interpreting the overall management direction (i.e., Special, General, or Enhanced Resource Management Zones).

To estimate the potential impact of allocating wildlife habitat to various resource management zones a *relative risk assessment* approach was used. Risk is defined as the probability or likelihood of an adverse event (Bergmann *et al.* 1993, Calow and Forbes 1997). For the purposes of this assessment an adverse event primarily includes such things as loss of habitat or increased risk of mortality (e.g., increased road access, bear-human conflict, legal and illegal hunting pressure) that may lead to population declines. In order to estimate risk, specific *assumptions* were required which focused on the compatibility or likelihood that wildlife habitat and populations would be maintained under particular RMZ designations developed by the Dawson Creek LRMP. These assumptions were derived primarily from the published literature, but where necessary used informed professional judgement. Overall, a combination of assumptions, habitat area summaries and management strategies were used to estimate the potential impact to environmental values. The assessment framework is depicted in Figure 9.

# Assessment Framework



**Figure 9: Assessment Framework showing the 3 Sources of Information used to Estimate Potential Impacts of Land Use Regimes on Wildlife**

Assumptions include the following general assumptions, as well as those of a more specific nature noted in Table 17.

- *Special, General and Enhanced Management land use designations roughly correspond to High, Intermediate and Low Biodiversity Emphasis Options (BEO) respectively.*
- *A High BEO provides more options for maintaining native species and ecological processes.*
- *Road access is considered a significant risk factor to all ungulate species and especially grizzly bears. Special Management RMZs provide the least amount of open roads whereas Enhanced RMZ's provide a much larger road network. (However, the alternative silvicultural systems proposed for the East Slopes (General) RMZ may result in similar road densities as an Enhanced RMZ.)*
- *Special Management RMZs and Protected Areas provide the least risk to wildlife over the long term and are considered compatible and preferred options for maintaining grizzly bear, woodland caribou, Stone's sheep, mountain goat, and marten.*
- *Management strategies (e.g., access) can partly mitigate the potential negative impacts of resource development activities (i.e., reduced risk). (Management strategies refer to both current management practices in the Base Case and/or specific strategies developed by the Dawson Creek LRMP).*

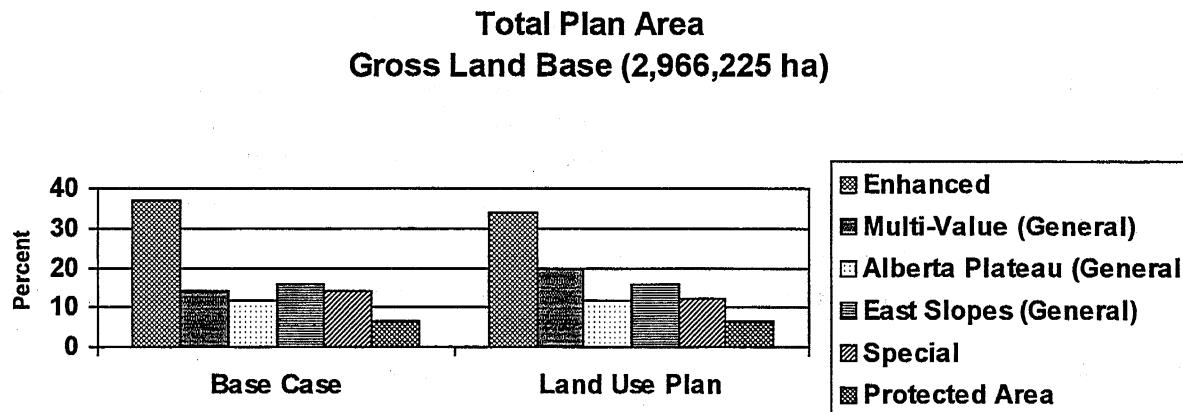
**Table 17: Relative Risk Levels and Rationale used to Estimate Potential Impacts of  
Alternative RMZ Designations on Environmental Values**

<b>Resource Management Zone Category</b>	<b>Risk Level</b>	<b>Rationale</b>
<b>Protected Areas</b>	<b>Low</b>	<ul style="list-style-type: none"> <li>• Future conditions expected to change the least. Generally roadless. Natural levels of biodiversity and wilderness values maintained.</li> </ul>
<b>Special Management</b> ⇒ Wildlife/Recreation ⇒ Wildlife/Coalfield ⇒ Cultural/Heritage ⇒ Major River Corridors	<b>Low-Moderate</b>	<ul style="list-style-type: none"> <li>• Adequate quantities of mature and old forests maintained due to Intermediate-High Biodiversity Emphasis Options</li> <li>• <i>Sensitive Access Management</i> designation suggests access concerns will be adequately addressed (significant portions of Major River Corridors subject to less restrictive access regime)</li> </ul>
<b>General</b> ⇒ Alberta Plateau ⇒ East Slopes	<b>Moderate</b>	<ul style="list-style-type: none"> <li>• Adequate quantities of mature and old forests anticipated to be maintained due to Intermediate-High Biodiversity Emphasis Options</li> <li>• <i>Sensitive Access Management</i> designation suggests access concerns will be adequately addressed.</li> <li>• However, increased development within these General RMZs suggest species and ecological processes dependent on these areas remain somewhat vulnerable over the long term.</li> </ul>
⇒ Multi-Value Plateau ⇒ Multi-Value Foothills	<b>Moderate-High</b>	<ul style="list-style-type: none"> <li>• Intermediate Biodiversity</li> <li>• <i>Optimum Access Management</i> designation</li> </ul>
<b>Enhanced</b> ⇒ South Peace ⇒ Grazing Reserves ⇒ Agriculture/Settlement	<b>High-Very High</b>	<ul style="list-style-type: none"> <li>• <i>Sustained Access Management</i> designation. Road network/densities remain high over the short and long term. NDT2 ecosystems at most risk due to altered seral stage distributions.</li> <li>• High levels of fragmentation and loss connectivity. Agriculture/Settlement causes permanent conversion of lands and loss of native species. Increased wildlife/human conflicts.</li> </ul>

### 9.3 Overview of the Plan Area

The amount of area allocated to each RMZ category is very similar between the Land Use Plan and the Base Case, as shown in Figure 10. In the Plan, a large total percentage of land is allocated to General RMZs (47%) and another one-third to Enhanced Resource Management. Almost 7% of the land base is allocated to Protected Areas and the remaining 13% is in Special Management.

**Figure 10: Allocation of Plan Area Gross Land Base by RMZ Category**



### 9.4 Biodiversity

Overall, the zoning proposed by the Land Use Plan will provide for similar levels of biodiversity as the Base Case (see Appendix I). In general, the Land Use Plan allocates NDT1 and NDT2 sub-zones to Special Management and NDT3 sub-zones to General and Enhanced. This will partly lessen the impacts to ecosystems by reducing the level of activity in natural disturbance types that are disturbed less frequently. The general clumping of lower intensity development RMZs (Wildlife/Recreation, Wildlife/Coalfield) and Protected Areas allocated along the foothills and Rocky Mountains also suggests a reduced level of regional fragmentation in the western and south-east corner of the Plan Area. (A much more detailed analysis of the biodiversity implications of the Base Case vs. the previous "Working Scenario" was undertaken at the request of the LRMP Table in the summer of 1997, and is included as Appendix III.)

### 9.5 Ecosystem Representation

The Land Use Plan would provide similar ecosystem representation as the Base Case. Both scenarios would achieve representation in all 6 ecosections including 6 of 6 major subzone variants. This is a significant improvement compared to the TSR regime, where existing Protected Areas provide representation in only 3 ecosections and 3 subzone/variants. A summary of ecosystem representation by RMZ category, including Protected Areas, is shown in Table 18.

**Table 18: Ecosystem Representation by RMZ Category\* - Biogeoclimatic Subzone/Variant Summary**

Subzone / Variant	Area (ha.)	TSR Management Regime: %						Base Case Regime: %						Land Use Plan: %					
		E	MV	AP	ES	S	PA	E	MV	AP	ES	S	PA	E	MV	AP	ES	S	PA
BWBSmw1	1,347,535	89	0	0	0	11	0	63	11	6	1	16	4	57	21	6	1	12	4
BWBSwk1	286,648	99	0	0	0	0	1	19	16	57	0	4	4	14	20	57	0	4	4
SBSvk1	3	0	0	0	0	0	100	0	0	0	0	0	100	0	0	0	0	0	100
SBSwk2	222,517	82	0	0	0	15	3	36	11	0	32	15	6	36	11	0	32	15	6
ESSFwk2	397,400	93	0	0	0	2	5	5	1	0	72	6	15	5	1	0	72	6	15
ESSFmv2	526,104	99	0	0	0	0	1	19	34	18	5	18	6	19	34	18	5	18	6
ESSFmv4	182	100	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	100	0
AT	185,835	94	0	0	0	0	6	1	15	0	39	25	21	1	15	0	39	25	21

\* E = Enhanced Resource Development; MV = Multi-Value (General Management); AP = Alberta Plateau; ES = East Slopes; S = Special Management; PAs = Protected Areas

**Note:** The amount of BWBSmw1 and BWBSwk1 in PAs is not accurate - the above statistics included the proposed Chain Lakes PA, not the proposed Bearhole PA. The Bearhole PA will provide more representation of the BWBSwk1 and less of BWBSmw1.

## 9.6 Old Growth

Of the 114,537 ha of old growth coniferous forest that occurs in the Plan Area, over half (58%) falls within the Timber Harvesting Land Base (THLB). The majority of the remaining old growth forests (36%) exists in forested exclusions (e.g., inoperable areas). Both the Base Case and the Plan allocate 8.2% of old growth to Protected Areas and about 13% to Enhanced RMZs, as depicted in Table 19. The majority of remaining old growth is distributed among the General RMZ where the likely BEO options vary from Low to High.

Almost 60% of the older deciduous stands also occur in the THLB, of which 59% of the mature deciduous stands are allocated to Enhanced RMZs in the Base Case vs. 52% in the Plan. These relatively high percentages suggest species dependent on mature and old deciduous forests are at risk from higher rates of timber harvest. Moreover, the *Dawson Creek TSA Timber Supply Review (1994)* also indicated that the amount of mature deciduous stands (>100 years old) would significantly decline over the next 50-100 years.

Although the Land Use Plan provides management direction to maintain old growth attributes which may partly mitigate the loss of old growth, the Plan doubles the amount of mature deciduous forests in Multi-Value RMZs from 15.6% (14,230 ha) in the Base Case to 31% (28,000 ha), due to a decrease in the amount of mature deciduous in Special Management from 22% in the Base Case to 13% in the Land Use Plan.

**Table 19: Allocation of Old Growth Forests (THLB) by RMZ Category\***

Hectares in THLB	Base Case Management						Land Use Plan					
	%E	%MV	%AP	%ES	%S	%PA	%E	%MV	%AP	%ES	%S	%PA
Old Growth Conifer (66,905 ha.)	13.6	15.1	20.9	27.9	14.3	8.2	12.4	17.2	20.9	27.9	13.4	8.2
Mature Deciduous (91,216 ha.)	58.6	15.6	0.8	0	22	3	52.4	30.7	0.8	0	13	3

\* E = Enhanced Resource Development; MV = Multi-Value (General Management); AP = Alberta Plateau; ES = East Slopes; S = Special Management; PAs = Protected Areas

**Note:** Hectares are total area of forest type present in the Timber Harvesting Land Base (THLB); Old Growth Conifer defined as BWBS >140 years & ESSF > 250 years.

Overall, the allocation of Biodiversity Emphasis Options (BEOs) together with the age class projections reported in the *Dawson Creek TSA Timber Supply Review(1994)* suggest species dependent on early seral habitats will potentially benefit in the short and long term while those dependent on mature and old seral forests will be at increased risk due to decreasing habitat availability over time.

## 9.7 Riparian Habitats

Although implementation of *Riparian Management Area (RMA) and Lakeshore Management Guidebooks* (FPC) will provide reduced impacts to riparian values (e.g., fish habitat, hydrological function) by retaining trees along *Riparian Reserve Zones*, discretionary management practices in RMAs suggest moderate risks remain that would mitigate against fully maintaining functional riparian ecosystems. Consequently, the Base Case trend is generally positive for fish and wildlife species that benefit from narrow riparian buffers, however, the extent to which riparian values are fully maintained will partly vary according to how well the suggested management practices outlined in the *Riparian Management Area Guidebook* are followed.

The Land Use Plan partly reduces the risks to riparian values by designating the Major River Corridor RMZs as Special Management. In addition, 18,500 ha of riparian habitat along the Peace River has been proposed as one of seven Goal 1 Protected Areas (i.e., Peace River/Boudreau Lake). The Land Use Plan also enhances riparian and regional connectivity by extending the Major River Corridors RMZ to include both the East and West Kiskatinaw Rivers and connect with the Bearhole proposed Protected Area

Overall, the designation of the Major River Corridors as Special Management and the objectives and strategies in the Land Use Plan provide increased certainty that riparian values will be addressed in lower level planning processes, reducing the risks to species and ecological processes dependent on riparian ecosystems over much of the Plan Area.

## 9.8 Wildlife

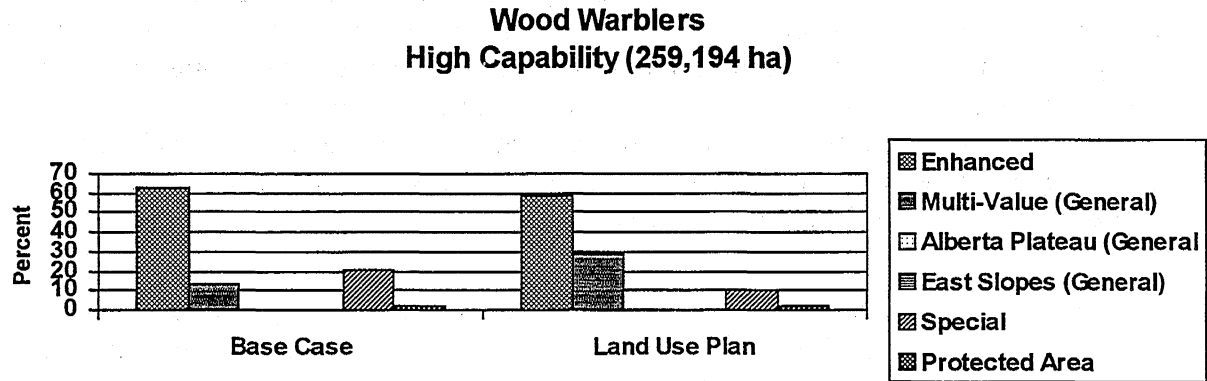
### 9.8.1 Warblers

As a group, wood warblers use a variety of habitats including mature coniferous, mature deciduous and mixed boreal forests. Some of the warblers that occur in the Dawson Creek Plan Area are currently red-listed (e.g., Connecticut Warbler) while others are Blue-listed (Black-throated Green Warbler, Canada Warbler, Philadelphia Vireo). Although some species prefer younger successional stages, many warblers as well as other bird species have been shown most abundant in older aspen-dominated forests (Schieck *et al.* 1995). The number of species of birds as well as their abundance generally increases in older stands primarily because these stands provide the most suitable foraging and nesting characteristics (e.g., greater canopy heterogeneity, snags, large live trees, downed woody material).

Most of the high capability warbler habitat identified by BC Environment occurs within the Agriculture/Settlement and Major River Corridor RMZs and are represented primarily by aspen and cottonwood forests that occur in riparian areas as well as mixed conifer-deciduous upland forests. About 50% of the total gross warbler habitat falls within the combined coniferous and deciduous THLB and the majority of remaining habitat is represented by forested exclusions (i.e., inoperable areas).



**Figure 11: Allocation of High Capability Warbler THLB Habitat by RMZ Category**



In the Base Case, almost two-thirds of the high capability warbler habitat that falls within the THLB occurs in Enhanced RMZs as shown in Figure 11. Although excluded areas will continue to provide habitat for warblers, some warbler species are at very high risks due to declining amounts of mature and old forests in the THLB. In addition, 95% of the high capability warbler habitat will be managed to meet Low BEO age class objectives which further indicates very high risks to warblers that require large contiguous areas of mature forests. Therefore, the Base Case outlook for warblers dependent on mature forests is extremely poor due to declining habitat availability. Over time, it is expected that the rate of harvest will result much lower warbler populations. However, retention of suitable *Wildlife Tree Patches* (WTPs) and trees in excluded areas may provide adequate habitat for some species and other passerine songbirds and partly reduce the risks from harvesting activities.

Although the Plan reduces the amount of warbler habitat in Special Management from 21% to 10.5% this does not necessarily correspond to increased risks to warblers compared to the Base Case. This because the Plan also shifts about 37% of high capability warbler habitat from Low BEO to Intermediate. This should result in more mature and old forest retention, which will reduce the overall risk. The Plan also provides strategies to identify and map Red and Blue-listed songbirds, suggesting increased certainty that warblers will be addressed during lower level planning. Moreover, management strategies that attempt to incorporate the habitat requirements of warblers into mixed wood management further suggests reduced risks to bird species dependent on mixed coniferous-deciduous forests.

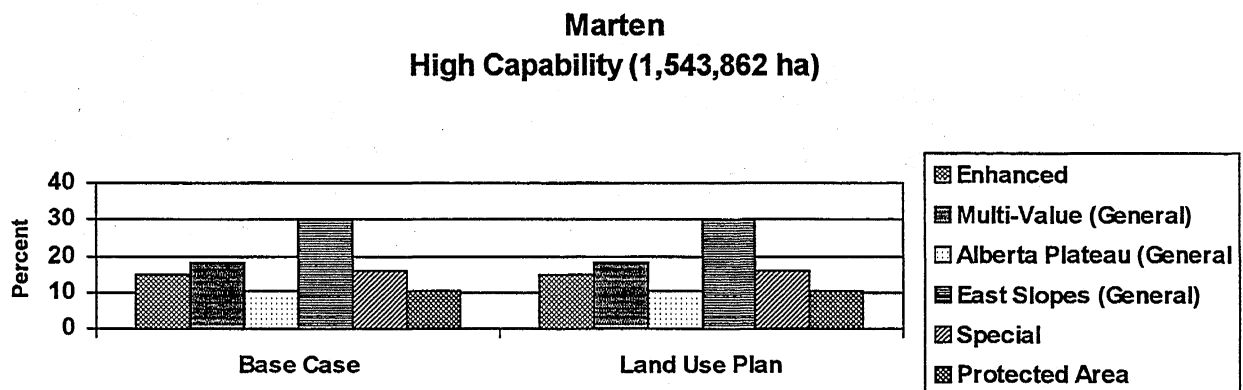
Despite these improvements, 54% of the high capability warbler habitat remains in areas that will be managed to meet Low Biodiversity age class objectives. Overall, the proposed RMZ categories and BEOs will result in increased habitat for warbler species that prefer younger seral forests and as well as those that can successfully survive and reproduce in edge-dominated landscapes. However, for species that require large contiguous patches of mature and old forests, these songbirds will likely occur at lower densities than natural levels and are at high risk of local population decline, even with the Land Use Plan.

### 9.8.2 Marten

Marten require relatively large areas of mature and old growth conifer forests to provide suitable foraging and denning habitat. Although marten populations have been shown to tolerate some forest harvesting within their home range, marten densities tend to decline proportionately with decreasing amounts of mature conifer forests (Thompson 1994; Thompson and Harestad 1994). Therefore, a High BEO is preferred over lower BEOs in providing age class objectives most compatible with maintaining mature/old forests and forest interior conditions.

Both the Base Case and the Plan allocate about 25% of high capability marten habitat to RMZs assumed to pose relatively low risks (i.e., Protected Areas and Special Management), as per Figure 12. The remaining marten habitat occurs in General and Enhanced Resource Management RMZs, which pose relatively high risks to marten habitat due to the Low to Intermediate BEOs proposed for these RMZs. The exception may be the Alberta Plateau RMZ where caribou guidelines may result in a High BEO, which is more compatible with maintaining marten populations. Nonetheless, these designations suggest overall, marten habitat supply will become limited over time which will result in lower marten population levels. Consequently, both the Base Case and Plan will result in lower densities of marten over the long term as mature forests are harvested over the next 50-100 years. The management objectives and strategies outlined by the Land Use Plan to maintain fur-bearer habitat (e.g., incorporate wildlife habitat features and known fur-bearer refuge areas into forest development plans) may mitigate somewhat the potential decline of fur-bearers over time. Alternative silvicultural systems proposed in the East Slopes RMZ may also help reduce the risks to marten habitat by maintaining adequate forest cover and structural attributes (e.g., large coniferous trees, coarse woody debris). Of the high capability habitat, 35% is in the THLB and is distributed among the RMZ categories in a similar manner to that depicted in Figure 12.

**Figure 12: Allocation of High Capability Marten Habitat by RMZ Category**

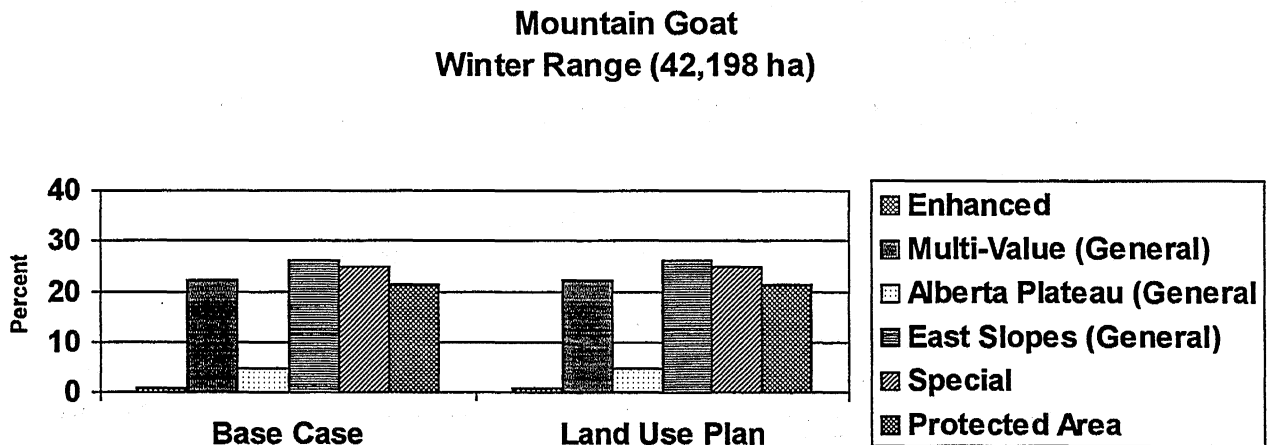


### 9.8.3 Mountain Goat

In general, suitable thermal, snow interception cover provided by mature forests and accessible forage sources are required to maintain ungulate winter range over the long term. Furthermore, these habitat requirements need to be distributed across the landscape over appropriate time and spatial scales. Mature forest cover (30-40%) is considered the limiting factor to maintain ungulate winter ranges for many species such as moose, deer and elk. Although some of the ungulates considered in this assessment are species associated with alpine and sub-alpine habitats (e.g., mountain goats, mountain sheep) resource development activities can have potential negative impacts due to increased access into remote areas which can result in increased legal and illegal hunting pressures.

Both the Base Case and the Land Use Plan allocate almost half of the high capability mountain goat habitat to RMZs that pose relatively low risks (i.e., Protected Areas 21% and Special Management, 25%). The remaining goat winter range is distributed among the East Slopes, and Multi-Value (Foothills and Plateau) RMZs and is considered to pose slightly higher risks (moderate to high) due to increased road access and human disturbance. However, the Sensitive Access Management strategies proposed for the East Slopes RMZ indicate potential negative impacts of an increased road network will be partly reduced. The Plan also directs lower level planning processes to manage ungulates in the Foothills and Plateau RMZs by identifying and mapping critical winter range, suggesting the Plan may also be able to partially mitigate the increased level of human disturbance in these zones.

**Figure 13: Allocation of Mountain Goat Winter Range by RMZ Category**

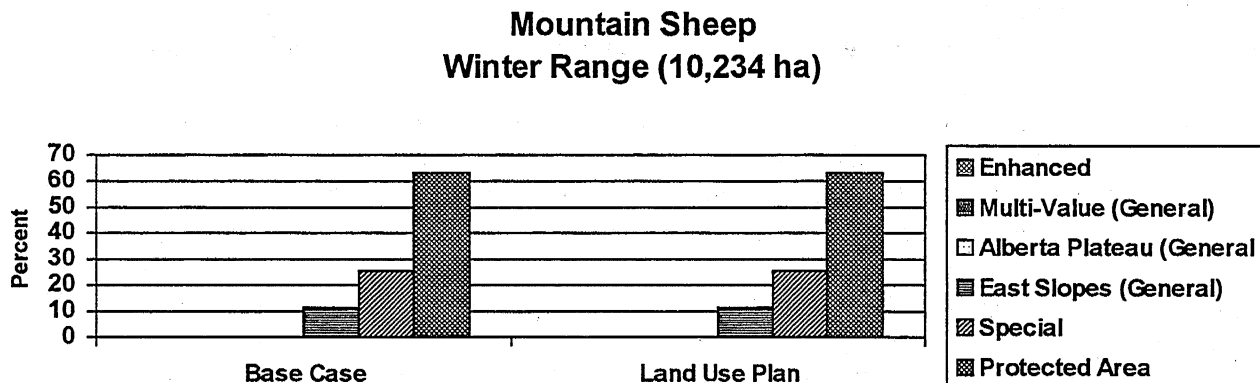


### 9.8.4 Mountain Sheep (Stone's & Rocky Mountain Bighorn)

Both the Base Case and the Land Use Plan provide low-to-moderate risks to mountain sheep. This is primarily due to the relatively large percentage of sheep winter range (63%) that is allocated to new Protected Areas, as shown in Figure 14. The remaining sheep winter range that occurs outside of the Protected Areas lies within Special Management RMZs

(e.g., Wildlife/Coalfield RMZ) and the East Slopes RMZ (General). Although sheep winter ranges within these RMZs are at slightly higher risks than those within Protected Areas, the Land Use Plan also provides Sensitive Access Management objectives and strategies (e.g., access restrictions, deactivation) within the Wildlife/Coalfield and East Slopes RMZs. This will partly reduce the potential adverse effects of increased road access (i.e., human disturbance, poaching). But as mentioned previously, the ability of access management strategies to significantly reduce the risks to sheep populations will vary with the effectiveness of each measure(s) implemented and how well they are enforced.

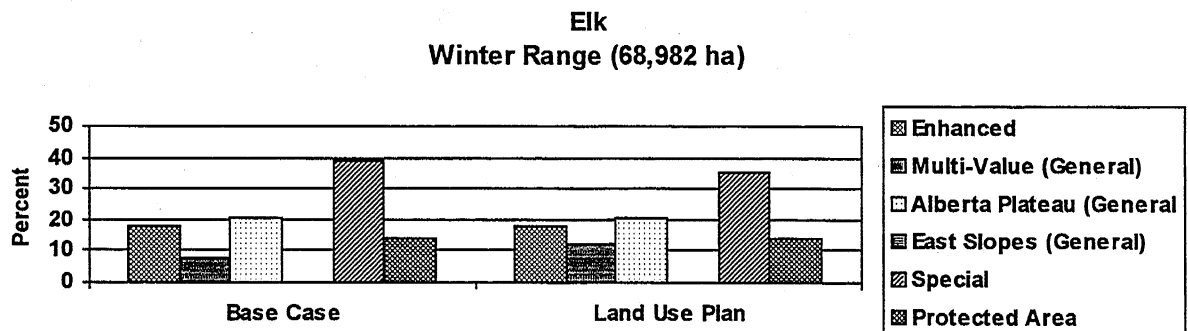
**Figure 14: Allocation of Mountain Sheep Winter Range by RMZ Category**



#### 9.8.5 Elk

The outlook for elk is generally positive under Base Case management, since 53% of the high capability elk habitat occurs in Protected Areas and Special Management under that regime. The Land Use Plan shifts about 3,000 ha from Special Management to Multi-Value (General) RMZs. The remaining habitat under both scenarios is distributed among higher intensity RMZs.

**Figure 15: Allocation of Elk Winter Range by RMZ Category**



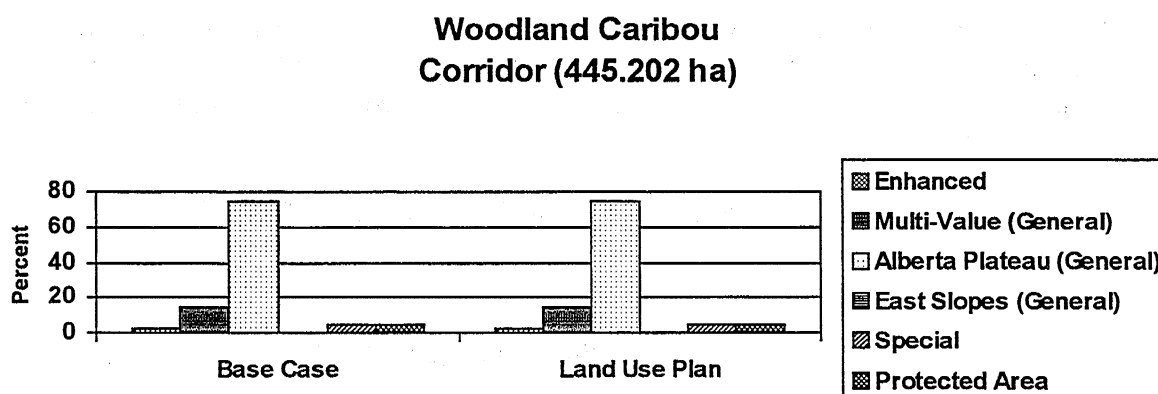
The Plan provides adequate protection for elk winter range. This is accomplished through the objectives and strategies (e.g., maintain and enhance winter range, reduced conflict with agriculture and grazing livestock) and by providing a more even distribution of BEOs that appear more compatible with maintaining elk habitat. Specifically, the Plan reduces the amount of elk winter range in Low Biodiversity from over half to about one-third and increases the amount of winter range in Intermediate from less than 20% to about one-third.

### 9.8.6 Woodland Caribou

Two areal indicators were used to assess impacts to caribou habitat. **Caribou Corridor** area reflects the summer and winter habitats used by caribou that occur in the Alberta Plateau RMZ. This area includes primarily low elevation habitat for resident caribou as well as low elevation winter habitat for an inter-provincial herd that migrates between Alberta and B.C. **Caribou Winter Range** area includes primarily high elevation (ESSF) habitats.

The caribou management zone discussed in the *AAC Rationale (1996)* roughly corresponds to the Alberta Plateau RMZ in the Land Use Plan, where management of low elevation pine forests are the priority. Although no specific management regime is currently in place, forest cover requirements are anticipated to meet High Biodiversity age class objectives. Consequently, the Base Case outlook for caribou habitat in the south-eastern portion of the district is generally positive. The GIS area analysis of the Base Case merely reflected the intended caribou zonation by including the majority (74%) of the caribou corridor in the Alberta Plateau RMZ, as per Figure 16. Less than 2% of caribou habitat occurs in Enhanced RMZs.

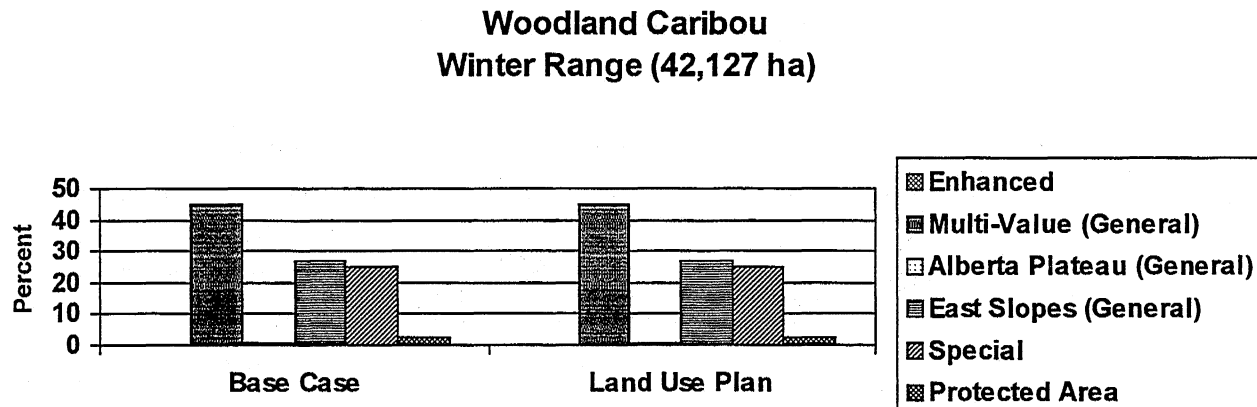
**Figure 16: Allocation of Caribou Corridor Habitat by RMZ Category**



Although the Land Use Plan provides the same area breakdown by RMZ as the Base Case, the Plan provides greater certainty that caribou corridor habitat will be addressed in lower level planning processes by explicitly stating caribou management objectives and strategies for the Alberta Plateau RMZ.

As for Caribou winter range, about 45% occurs in the Multi-Value RMZ in both the Base Case and Plan, as shown in Figure 17. The remaining amount is distributed in RMZs that lower the risks to caribou (East Slopes RMZ, Special Management, Protected Areas).

**Figure 17: Allocation of Caribou Winter Range by RMZ Category**



The Land Use Plan provides enhanced protection for caribou winter range compared to the Base Case through a number of management objectives and strategies. These strategies are designed to provide large contiguous patches of mature and old seral forest, extend timber harvesting rotations (to reduce the potential negative impacts of reduced winter habitat supply over the long term), and manage access through the use of Sensitive Access Management strategies (e.g., road deactivation, access restrictions). The Plan also suggests that caribou winter range be identified and managed as *Wildlife Habitat Areas* as part the *FPC Identified Wildlife Strategy*. Overall, these strategies provide increased certainty that caribou management objectives will be achieved and provide the necessary input from a higher level plan to meet landscape level objectives as recommended in the *Managing Identified Wildlife Guidebook* (Draft, 1996).

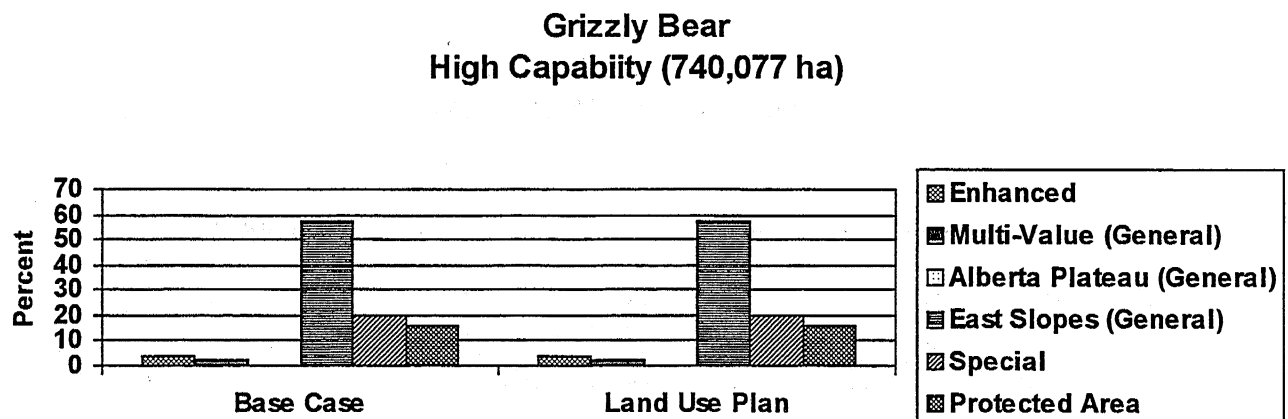
### 9.8.7 Grizzly Bears

The impacts of roads and human settlement on grizzly bears have been studied extensively in southern British Columbia (McLellan and Shackleton, 1988) and western Montana (Mace *et al.*, 1996). In general, these studies (and others) clearly identify road access as a high risk factor in maintaining suitable grizzly bear habitat and viable populations. Therefore, the potential effects of the Base Case and the Land Use Plan on grizzly bear habitat and populations varies primarily with how much grizzly bear habitat is allocated to each RMZ category and the management objectives and strategies identified by the LRMP - particularly as they relate to access management.

The GIS area analysis indicates 16% of high capability grizzly bear habitat is allocated to Protected Areas for both the Base Case and Land Use Plan, as indicated in Figure 18. The area analysis also indicated over half (57%) of the grizzly bear habitat occurs within the East Slopes RMZ for both scenarios and another 20% falls within the Special Management

RMZs (Wildlife/Recreation, Wildlife/Coalfield). The remaining 7% is distributed among the higher risk RMZs (Enhanced and Multi-Value).

**Figure 18: Allocation of High Capability Grizzly Bear Habitat by RMZ Category**



Although the *AAC Determination* (1996) indicated high capability grizzly bear habitat (NDT1) would be managed (in the interim) to meet Intermediate biodiversity age class objectives, considerable uncertainty remained regarding access management. Therefore, relatively high risks would remain to grizzly bears in the Base Case over the short and long term. The Land Use Plan partly addresses these concerns and attempts to minimize the risks to grizzly bears by providing Sensitive Access Management (e.g., seasonal road restrictions) strategies in the East Slopes RMZ. In addition, winter harvesting is also encouraged to reduce bear/human conflicts as well as the use of alternative silvicultural systems to maintain forest cover in appropriate areas.

The Land Use Plan also provides more mature forest cover compared to the Base Case by reducing the amount of grizzly bear habitat in Low Biodiversity to 6.8% and substantially increasing the amount in High Biodiversity to 20%. Although this BEO distribution, as well as the management strategies outlined by the Plan, will partly reduce the risks to grizzly bears, it should be emphasized that the cumulative impact of resource development activities that will occur over time in the East Slopes RMZ will likely result in less suitable habitat available for grizzly bears. Therefore, risks to grizzly bear survival will remain moderate to high over the long term. Furthermore, even though selection silvicultural systems (p. 116) may better maintain forest cover and berry-producing habitats, a greater road network is usually required and may actually increase the mortality risk to grizzly bears. Indeed, the ability of access management strategies to significantly reduce the risks to grizzly bears will vary with the effectiveness of each measure(s) implemented and how well they are enforced. This may be most critical in those areas that are managed using selection silvicultural systems.

## 9.9 Conclusions

Overall, the allocation and distribution of RMZ designations as they relate to environmental values suggests implementation of the Land Use Plan would result in similar impacts compared to the Base Case. However, the Land Use Plan moderately improves the outlook for most wildlife species and their habitats by recommending management objectives and strategies that provide more direction and increased certainty that environmental values will be adequately addressed during lower level planning processes.

The allocation of Special Management RMZs (Wildlife/Recreation, Wildlife/Coalfield, and Major River Corridors RMZs) and Protected Areas in areas where significant wildlife values occur (e.g., Pine-Lemoray, North Kakwa, Narraway River) reduces the risks to wildlife habitats, populations and ecosystem processes. Plant and animal species dependent on mature and old growth conifer and deciduous forests remain more vulnerable due to forest harvesting activities in Multi-Value and Enhanced RMZs. Although the anticipated decline in the availability of mature and old deciduous forests increases the risks to species dependent on these ecosystems, the management objectives and strategies (e.g., maintain warbler habitat, mixed wood management) outlined by the Dawson Creek LRMP may partly mitigate potential impacts during lower level planning processes (i.e., landscape and stand level planning).

Other positive incremental impacts compared to the Base Case include Sensitive Access Management strategies outlined for the East Slopes, Alberta Plateau and Wildlife/Recreation, Wildlife/Coalfield RMZs which may reduce the potential adverse effects of an increased open road network. In general, the Land Use Plan provides an increased level of certainty that access management will be adequately addressed and therefore reduces the risk to wildlife populations and wilderness values over the long term, assuming that the LRMP recommendations are implemented and enforced.



## 9.10 References (for Environmental Resource Analysis)

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**APPENDIX I: Dawson Creek LRMP - Anticipated Biodiversity Options for Landscape Units**

Landscape	THLB (hectares) Total: 1,086,444 ha.	Biodiversity Emphasis Option Designation		
		Base Case*	Land Use Plan (April 1997)**	Interim BEO (May 1998)**
Beaudette	22,890 (Coniferous)	I	I	I
Belcourt	17,554 (Coniferous)	I	H	I
Beryl Prairie	16,750 (Deciduous)	L	L	L
Burnt River	33,139 (Coniferous)	I	I	H
Carbon	34,209 (Coniferous)	I	I	I
Dawson Creek	19,707 (Deciduous)	L	L	L
Dunlevy	12,694 (Mixed)	H	H	H
Flatbed	44,423 (mostly Coniferous)	I	L	I
Gething	29,715 (Coniferous)	I	L	L
Gwillam	37,293 (mostly Coniferous)	I	H	I
Hasler	59,204 (Coniferous)	I	L	L
Imperial	11,678 (Coniferous)	H	I	H
Johnson Creek	32,519 (Mixed)	L	L	L
Kinuseo	14,873 (Coniferous)	L	I	I
Kiskatinaw	38,703 (Deciduous)	L	L	L
Lower Moberly	51,840 (Deciduous)	L	I	L
Lower Murray	40,890 (Deciduous)	L	L	L
Lower Sukunka	47,313 (mostly Coniferous)	L	L	L
Monkman	6,808 (Coniferous)	I	I	I
Narraway	8,490 (Coniferous)	H	H	I
One Island	120,260 (Mixed)	L	I	I
Peace River	15,955 (Deciduous)	I	H	I
Pine Pass	31,662 (Coniferous)	H	H	I
Pine River	51,186 (Mixed)	I	L	L
Puggins	55,863 (Deciduous)	L	L	L
Red Deer	19,692 (Coniferous)	I	I	I
Redwillow	45,880 (mostly Coniferous)	I	I	H
Septimus	38,012 (Mixed)	I	I	I
Upper Sukunka	32,693 (Coniferous)	I	I	I
Upper Moberly	38,390 (mostly Coniferous)	I	I	I
Wapiti	23,670 (Coniferous)	I	I	I
Wolverine	32,488 (Coniferous)	I	L	I

Note: Existing/proposed Protected Areas take precedence over the Landscape Unit Biodiversity labels.

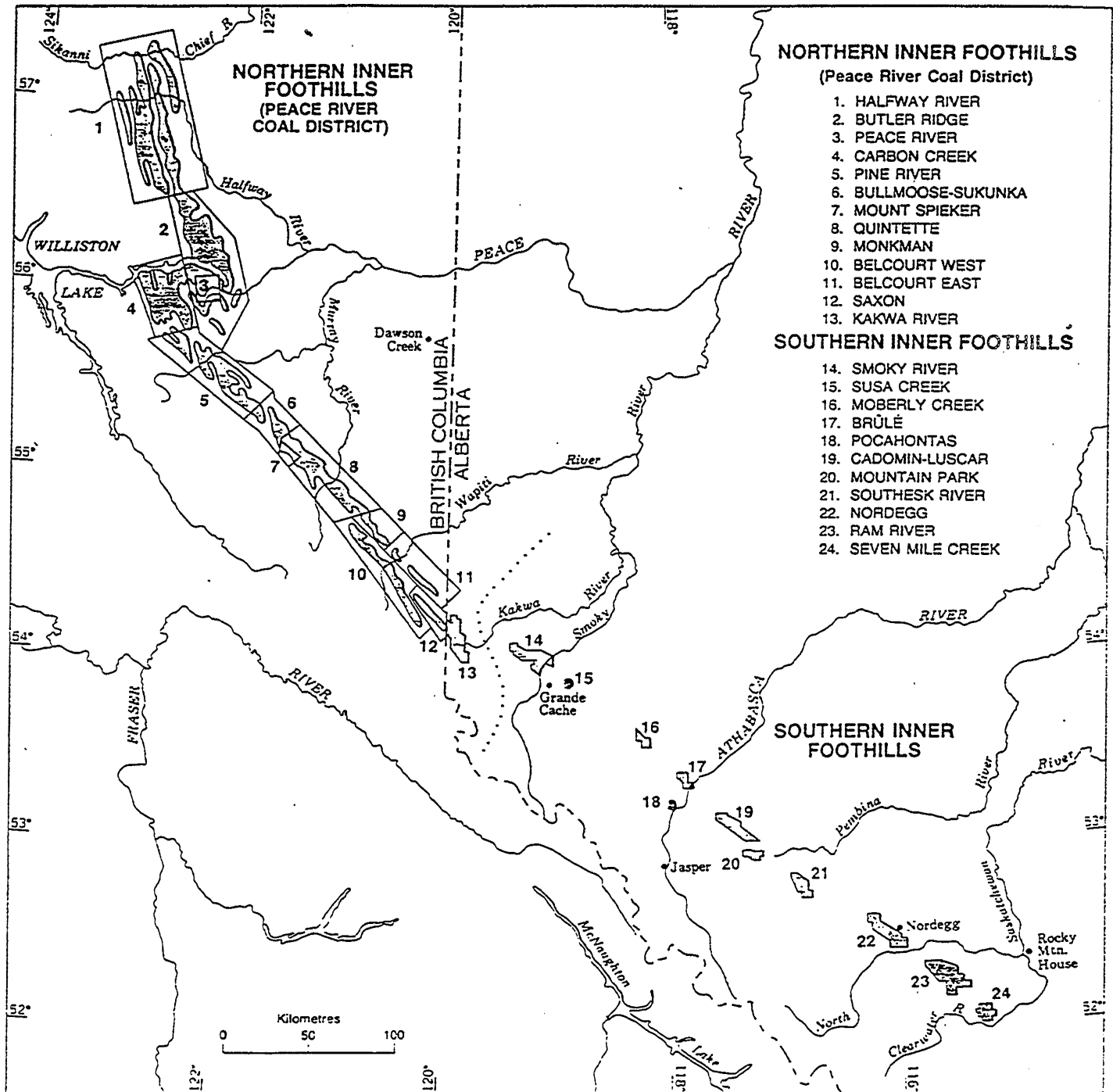
\* IPT best estimate of likely Biodiversity Emphasis Option (BEO) in the absence of an LRMP (L = Low, I = Intermediate, H = High)

\*\* Middle column is the April/97 initial IPT interpretation of Biodiversity based upon Land Use Plan document; Regional Landscape Planning Strategy BEO options in the right-hand column are the more likely BEOs, however.



## APPENDIX II

### Coal Districts and Coalfields in the Inner Foothills Belt of the Rocky Mountains\*



\*Source: G.G. Smith, *Coal Resources of Canada*, Geological Survey of Canada, Paper 89-4, p. 58.



**APPENDIX III:**  
**IMPLICATIONS OF PROPOSED BIODIVERSITY EMPHASIS OPTIONS**

**Base Case vs. Working Scenario**

**prepared by**

**Eliot Terry (R.P. Bio.)**  
**Keystone Wildlife Research**

**August 15, 1997**

**(Revised)**

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## 1.0 INTRODUCTION

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This report provides a brief summary of the potential effects of managing 32 landscape units that occur within the Dawson Creek LRMP plan area to meet both a default Biodiversity Emphasis Options (i.e., Base Case) and the Proposed Biodiversity Emphasis Options (Working Scenario). The information contained in this report complements the previous analysis which used the larger Land Use Areas (LUAs) as the management unit and associated resource management intensity. As such, this landscape unit analysis attempts to provide a finer scale evaluation focusing on how the distribution of Biodiversity Emphasis Options (BEOs) could potentially effect each indicator species.

## 2.0 METHODS

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Similar to the previous analysis the Dawson Creek LRMP draft plan was used to provide *Management Objectives and Strategies*. The GIS area statistics were used to provide how much habitat for each indicator species was represented in each Biodiversity Emphasis Option. Many of the assumptions were outlined in the previous SEEA analysis (March 1997) and are not repeated here. However, a brief list of the key assumptions pertinent to this analysis are listed below.

### **Key Assumptions used to determine potential impacts of Biodiversity Emphasis Options on wildlife habitat.**

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- ▶ *Protected Areas and/or High Biodiversity Emphasis preferred option(s) for species requiring relatively large areas of undisturbed wilderness, greater amounts of mature and old forests, and interior forest conditions. This includes most species being considered for the Dawson Creek LRMP including grizzly bear, Mountain goat, woodland caribou, Stone's Sheep, marten and some warbler species. The exception is elk, where a less constraining Biodiversity Emphasis Options (e.g., Low-Intermediate) would likely provide an adequate distribution of seral stages to meet winter habitat requirements.*
- ▶ *Managing landscape units to meet lower seral stage requirements (i.e., Intermediate and Low Biodiversity Emphasis Options) increases the risks to most of these species because these BEOs provide less mature and old forests, less habitat connectivity and potentially more open roads. In general, a Low BEO (25% of natural mature forests retained) would be associated with relatively high risks (i.e., high to very high); Intermediate BEO (50% natural mature forests retained) with high to moderate risks; High BEO (75% natural mature forests retained) would provide relatively low to moderate risks and Protected Areas (depending on size and location) would provide the least risk.*
- ▶ *Because access is considered a relatively high risk factor for grizzly bears as well as many of the ungulate species, assessing potential impacts based solely on seral stage*



*distribution is inadequate. Therefore, further assumptions are required to more completely evaluate habitat suitability of different BEOs. In general, it is assumed that the amount of open roads would increase with less constraining BEOs. The exception would be in the Grizzly LUA area where proposed Intermediate BEO and selective harvesting will result in more open roads in the ESSFwk2.*

- ▶ *Management Objectives and Strategies (e.g., access management) were assumed to partly mitigate risk levels (e.g., reduce risks from high to moderate levels).*
- ▶ *Although forest exclusions (e.g., poor productivity timber types, inoperable areas) can contribute to overall biodiversity, they often represent many small areas widely distributed across the land base. Consequently, they do not necessarily function as habitat for some species - especially larger mammals or bird species that require large contiguous patches of mature and old forests.*

### 3.0 RESULTS

#### 3.1 Overview

The Working Scenario moderately reduces the risks to biodiversity compared to the Base Case by decreasing the amount of land in Low Biodiversity from 55% to 42% (Fig. 1). This results in more of the plan area (i.e., landscape units) being managed to meet Intermediate and High Biodiversity age class objectives.

The distribution of Biodiversity Emphasis proposed by the Working Scenario closely reflects the suggested guideline of 10:45:45 outlined in the Biodiversity Guidebook (1995).

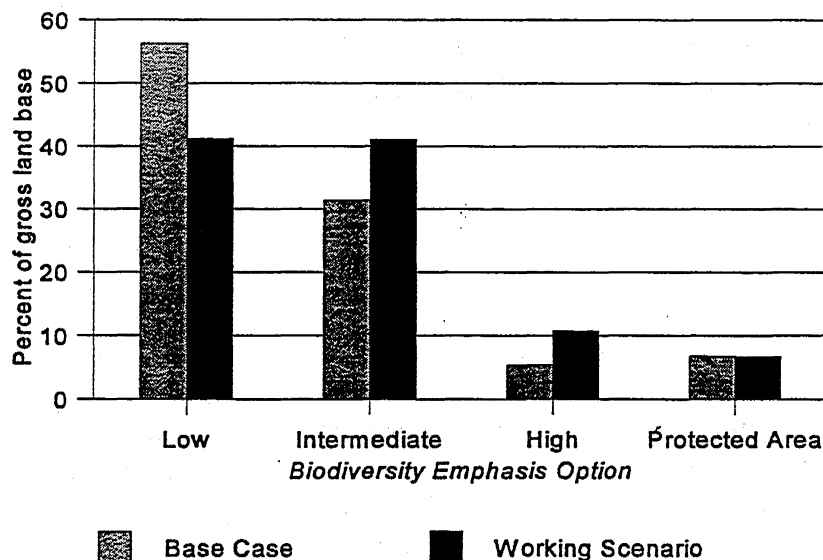


Fig. 1. Areal breakdown of Dawson Creek plan area by Biodiversity Emphasis Option. Base Case vs Working Scenario.

## 4.0 WILDLIFE

### 4.1 Grizzly Bear

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. 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).

The Base Case area analysis indicates most (68%) high capability grizzly bear habitat will be managed to meet *Intermediate BEO* age class objectives with the remaining amount distributed equally between Low BEO and Protected Areas. This breakdown reflects (in part) the *AAC Rationale* that stated that NDT1 would be managed to meet Intermediate age-class objectives. Whether Intermediate Biodiversity could provide adequate quantities of mature and old forests for grizzly bears, largely depends on where it is distributed within each landscape unit. However, even if mature forests were maintained and distributed appropriately, relatively high risks remain to grizzly bears in the Base Case due to uncertainty regarding access management.

The Working Scenario also proposes grizzly bear habitat be managed to meet Intermediate BEO seral stage requirements and is reflected in the relatively high percent (58%) in Intermediate (Table 1 ). The Working Scenario, however, provides more mature forest cover for grizzly bears compared to the Base Case by reducing the amount in Low Biodiversity to 6.8% and substantially increasing the amount in High Biodiversity (20%, Table 1). This change in Biodiversity Emphasis suggests reduced risks to grizzly bears that depend on habitats in these landscape units (e.g. Narraway, Pine Pass). In addition, the Working Scenario, proposes that high elevation ESSF forests be harvested using alternative silvicultural systems (i.e., partial cutting) which will also help to maintain some mature forest cover.

Table 1 . Areal breakdown of high capability grizzly bear habitat by Biodiversity Emphasis Option .  
Base Case vs Working Scenario. Dawson Creek LRMP.

BEO	Base Case		Working Scenario	
	ha	%	ha	%
Low	120,769	16.3	50,728	6.8
Intermediate	501,288	67.7	427,586	57.8
High	538	0.07	144,280	19.5
Protected Area	117,483	15.9	117,483	15.9
Total	740, 078	100	740,078	100

As stated previously, whether Intermediate Biodiversity age class objectives are compatible with maintaining grizzly bear habitat requirements will largely depend on where and how the mature forest is distributed within each landscape unit. If the mature and old forests is 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 is concentrated only in inoperable areas or poor productivity sites then clearly the risks to bears are much higher as seasonal habitats remain vulnerable. The GIS area summaries indicate about a 27% of the high capability grizzly bear habitat occurs in the timber harvesting land base with the remaining amounts in forest exclusion and non-forest exclusions (Fig. 2).

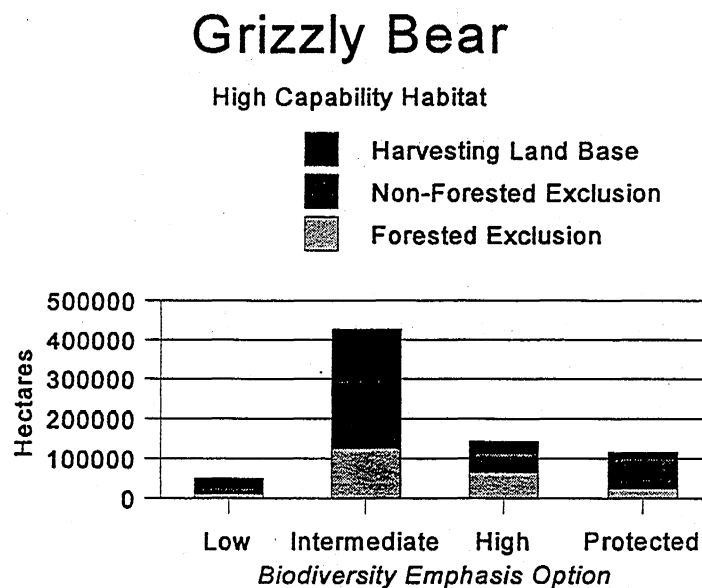


Fig. 2. Distribution of high capability grizzly bear habitat in each Biodiversity Emphasis Option. Working Scenario.

Despite these planned improvements in seral stage distribution, the access management strategies proposed by the Working Scenario suggest both positive and negative implications. That is, although the Working Scenario proposes restricted access management in the Grizzly LUA which is a positive step towards reducing bear-human conflicts, it also proposes selective logging in the ESSFwk2. While this is the most appropriate silvicultural system to regenerate high elevation forests, and may better maintain critical berry-producing shrubs for bears, a greater open road network is usually associated with selective timber harvesting because a greater area is required to access the allowable cut as well as to maintain silvicultural operations. Therefore, although selective timber harvesting may reduce the risks to foraging habitats compared to the Base Case, the indirect effect of a greater open road network increases the mortality risks to

grizzly bears. The Working Scenario, however, proposes restricted access management strategies in the landscape units that contain high capability grizzly bear habitat which may partly mitigate potential adverse effects.

## 5.0 Ungulate Winter Range

### 5.1 Woodland Caribou

Although the GIS area summaries indicate both the Base Case and the Working Scenario allocate the **caribou corridor** among the different BEOs (Table 2), management strategies outlined in the *AAC Rationale* as well as the Dawson Creek LRMP propose that the caribou corridor be managed to meet High Biodiversity age class objectives. Therefore, the main difference between the Base Case and the Working Scenario is related to the indirect effects of Biodiversity Emphasis in areas where caribou habitat overlaps with Low and Intermediate Biodiversity landscape units as well as management strategies. Overall, the Working Scenario provides enhanced protection for caribou and reduces the risks compared to the Base Case by explicitly stating caribou management objectives and strategies designed to maintain old growth habitat areas and mitigate increased access.

Table 2 . Areal breakdown of the caribou corridor by Biodiversity Emphasis Option .  
Base Case vs Working Scenario. Dawson Creek LRMP.

BEO	Base Case		Working Scenario	
	Gross (ha)	%	Gross (ha)	%
<i>Low</i>	146,370	32.9	88,055	19.8
<i>Intermediate</i>	159,455	35.8	261,559	58.7
<i>High</i>	118,062	26.5	74,273	16.7
Protected Area	21,315	4.8	21,315	4.8
<b>Total</b>	<b>445,202</b>	<b>100</b>	<b>445,202</b>	<b>100</b>

The Working Scenario also reduces the risks to **caribou winter range** by increasing the amount in High Biodiversity from 2.4 % in the Base Case to 21.6% (Table 3). In addition, the Working Scenario also proposes the establishment of *Wildlife Habitat Areas* (WHAs) to protect caribou winter range values which provide increased certainty that caribou management objectives will be achieved - especially in those landscape units designated as Intermediate and Low.

Table 3 . Areal breakdown of high capability caribou winter range by Biodiversity Emphasis Option .  
Base Case vs Working Scenario. Dawson Creek LRMP.

BEO	Base Case		Working Scenario	
	Gross (ha)	%	Gross (ha)	%
<i>Low</i>	11,747	27.9	13,844	32.9
<i>Intermediate</i>	28,284	67.1	16,563	39.3
<i>High</i>	1,106	2.6	9,000	21.4
Protected Area	991	2.4	991	21.6
<b>Total</b>	<b>42,127</b>	<b>100</b>	<b>42,127</b>	<b>100</b>

## 5.2 Mountain Goat

The Working Scenario improves the outlook for mountain goats compared to the Base Case by increasing the amount of goat winter range in High Biodiversity from 2.6 % to 21% (Table 4). Although most of mountain goat habitat exists in forest and non-forest exclusions (Fig 3 ), over 40% of the goat winter range is in High Biodiversity and Protected Areas which is considered to provide relatively low risks to goat populations.

Table 4 . Areal breakdown of mountain goat winter range by Biodiversity Emphasis Option .  
Base Case vs Working Scenario. Dawson Creek LRMP.

BEO	Base Case		Working Scenario	
	Gross (ha)	%	Gross (ha)	%
<i>Low</i>	8,229	19.5	7,544	17.9
<i>Intermediate</i>	23,781	56.4	16,563	39.2
<i>High</i>	1,098	2.6	9,000	21.3
Protected Area	9,091	21.5	9,091	21.5
<b>Total</b>	<b>42,198</b>	<b>100</b>	<b>42,198</b>	<b>100</b>

## Mountain Goat

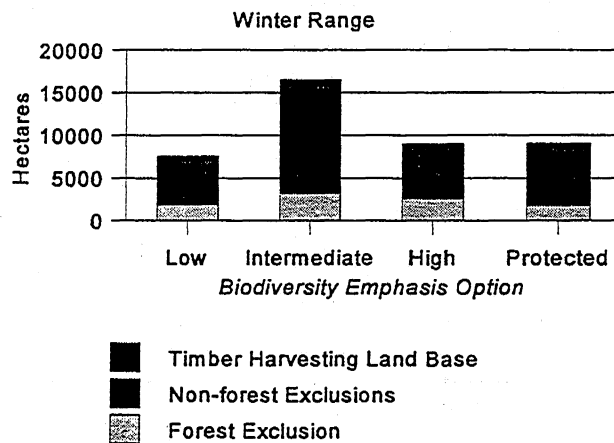


Fig. 3. Distribution of mountain goat winter range by Biodiversity Emphasis Option. Dawson Creek LAMP Working Scenario.

### 5.3 Stone's and Rocky Mountain Bighorn Sheep

Because sheep are typically associated with alpine and subalpine habitats, the majority of habitat occurs in non-forest and forest exclusions (Fig. 4) which suggests very little direct conflict with forest harvesting activities. Instead, access into remote areas is the primary risk factor.

The outlook for mountain sheep is generally positive under the Base Case as almost two-thirds of the sheep winter range is in Protected Areas (preferred land use designation) (Table 5). However, the remaining third remains at risk due to the Low Biodiversity designation which are assumed to have greater levels of resource development activities and increased access.

The Working Scenario reduces the risks to sheep winter range and improves the outlook for sheep populations by shifting much of the area in Low to High Biodiversity (Table 5). This results in a total of 89% of mountain sheep winter range in Protected Areas (64%) and High Biodiversity (25%) (Fig 4). This allocation together with management strategies (particularly access) proposed by the Working Scenario suggests relatively low risks to mountain sheep.

Table 5. Areal breakdown of mountain sheep winter range by Biodiversity Emphasis Option .  
Base Case vs Working Scenario. Dawson Creek LRMP.

BEO	Base Case		Working Scenario	
	Gross (ha)	%	Gross (ha)	%
<i>Low</i>	3,570	35.1	0	0
<i>Intermediate</i>	121	1.2	1,192	11.7
<i>High</i>	0	0	2,498	24.6
Protected Area	6,474	63.7	6,474	63.7
<b>Total</b>	<b>10,164</b>	<b>100</b>	<b>10,164</b>	<b>100</b>

## Mountain Sheep

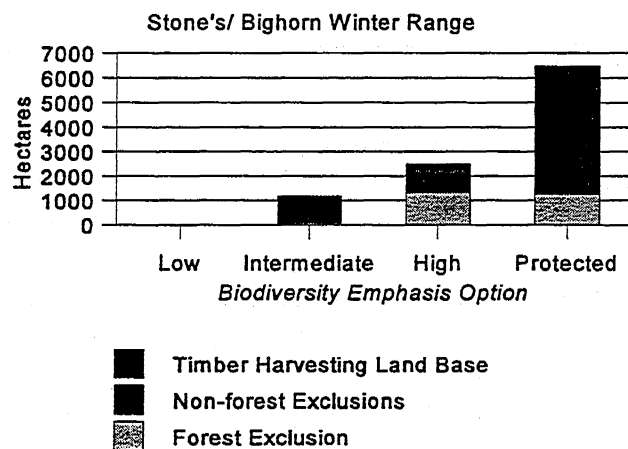


Fig. 4. Distribution of mountain sheep winter range by Biodiversity Emphasis Option. Dawson Creek LRMP. Working Scenario.

## 5.4 Elk

The Base Case would provide low to moderate risks to elk as the majority (57%) of elk habitat would be managed to meet Low Biodiversity age class objectives. The Working Scenario improves the outlook for elk by reducing the amount in Low to 35% and increasing the amount of Elk winter range in Intermediate from 12% to 37% (Table 6). Although how the mature forest will be distributed remains unclear, the BEO's proposed by the Working Scenario suggests a

more balanced distribution. *Management Strategies and Objectives* outlined by the Dawson Creek LRMP also indicate enhanced protection for elk winter range. Overall, the BEO allocation, management strategies as well as the relatively large area included in exclusions (e.g., scrub-steppe grasslands, south facing river breaks) suggests relatively low risks to elk winter range under the proposed Working Scenario( Fig 5).

Table 6 . Areal breakdown of elk winter range by Biodiversity Emphasis Option .  
Base Case vs Working Scenario. Dawson Creek LRMP.

BEO	Base Case		Working Scenario	
	Gross (ha)	%	Gross (ha)	%
<i>Low</i>	39,231	57.2	24,097	35.2
<i>Intermediate</i>	8,363	12.2	25,238	36.8
<i>High</i>	11,336	16.5	9,594	14.0
Protected Area	9,616	14.0	9,616	14.0
<b>Total</b>	<b>68,545</b>	<b>100</b>	<b>68,545</b>	<b>100</b>

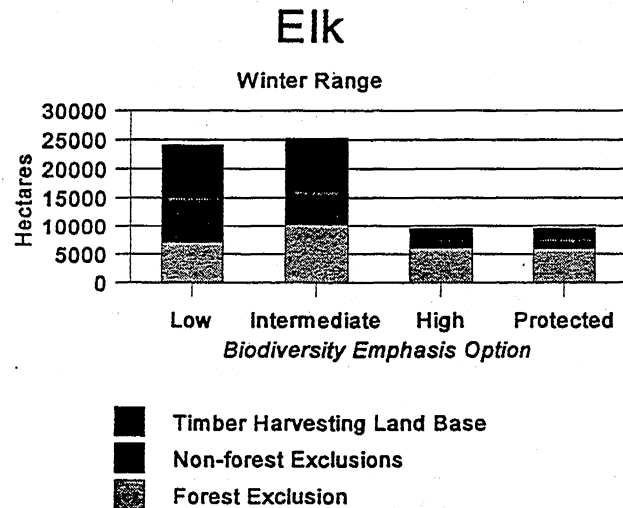


Fig. 5. Distribution of elk winter range by Biodiversity Emphasis Option.  
Dawson Creek LRMP. Working Scenario.



## 6.0 Marten

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, maintaining mature forests and forest interior conditions are best met by a High Biodiversity Emphasis Option which provides age class objectives that are most compatible (least risk) with maintaining marten habitat.

The Base Case allocates the majority of marten habitat to Intermediate (53%) and Low (32%) Biodiversity whereas less than 5% is allocated to High Biodiversity (Table 7). This allocation suggests relatively high risks to marten as declining amounts of mature and old forests in these landscape units will result in declining populations over time.

The Working Scenario moderately improves protection for marten by increasing the amount of habitat in High Biodiversity to 17%. However, similar to the Base Case, the majority of marten habitat remains in Intermediate (45%) and Low Biodiversity (27%). Although about 33% exists in forest exclusions, 36% remains in the timber harvesting land base (Fig. 6). *Management Objectives and Strategies* outlined by the Dawson Creek LRMP to maintain furbearer habitat may mitigate to some degree the potential decline of marten as mature forests are harvested over time. In addition, selective timber harvesting proposed in the Grizzly LUA may also reduce impacts to marten populations (considerable overlap) as alternative silvicultural systems are more compatible with maintaining mature forested habitats.

Table 7. Areal breakdown of high capability marten habitat by Biodiversity Emphasis Option .  
Base Case vs Working Scenario. Dawson Creek LRMP.

BEO	Base Case		Working Scenario	
	Gross (ha)	%	Gross (ha)	%
<i>Low</i>	487,386	31.9	407,028	26.7
<i>Intermediate</i>	804,277	52.7	694,667	45.5
<i>High</i>	75,465	4.9	265,423	17.4
Protected Area	158,244	10.4	158,244	10.4
Total	1,525,362	100	1,525,362	100

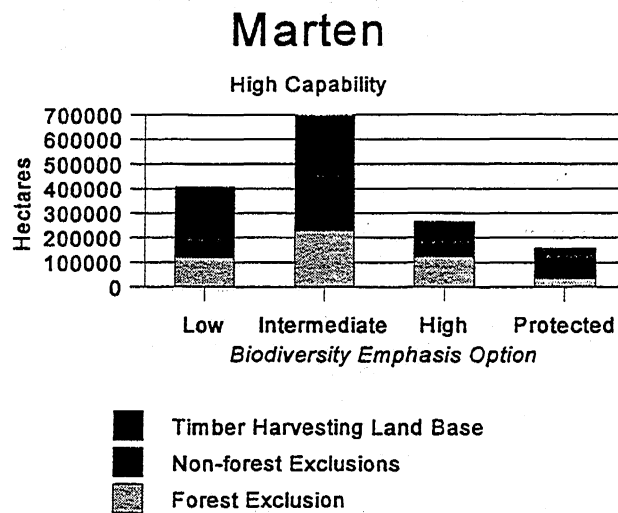


Fig. 6. Distribution of high capability marten habitat by Biodiversity Emphasis Option. Dawson Creek LRMP. Working Scenario.

## 7.0 Warblers

Currently, little empirical data exists on managing landscapes to meet different seral stage requirements and the effect of on abundance of various warbler species. However, many warblers as well as other forest birds have been shown to be most abundant in older aspen-dominated forests (Shieck *et al.* 1995). In addition, recent preliminary information from the Prince George Region suggests that lower BEO options increase the risks to some bird species (Seip 1996). Although Seip (1996) did not focus on warblers specifically, he reported that bird species associated with mature and old forests were predicted to progressively decline as biodiversity restrictions were relaxed. Projected abundance levels indicated some species were reduced to 35-50% of natural abundance levels. One warbler species (yellow-rumped) typically associated with both young and mature forests showed little change in relative abundance among BEOs.

The GIS area analysis indicates that under the Base Case, most (95%) of the warbler habitat will be managed to meet a Low BEO which suggests very high risks to warblers requiring contiguous mature and old forests (Table 8). The Working Scenario partly decreases the risks to warblers by shifting more area from Low to Intermediate. However, over half (53.8%) of the identified warbler habitat remains in a Low BEO which is still considered at high risk. Although about 20% (101,712 ha total across all BEOs) of warbler habitat occurs in areas excluded from timber harvesting, about half (50%) occurs in the timber harvesting land base (Fig. 7). This relatively

high percent combined with the projected age-class distribution (TSR 1994) which indicates a declining amount of mature deciduous stands (>100 years old) over the next 50-100 years, further suggests warbler species dependent on early seral stages will benefit as habitat supply increases while those dependent on mature and old forests will be at increasing risk due to decreasing habitat availability.

Table 8 . Areal breakdown of high capability warbler habitat by Biodiversity Emphasis Option .  
Base Case vs Working Scenario. Dawson Creek LRMP.

BEO	Base Case		Working Scenario	
	Gross (ha)	%	Gross (ha)	%
<i>Low</i>	487,065	95.1	275,682	53.8
<i>Intermediate</i>	1	0	188,653	36.8
<i>High</i>	3,474	0.7	26,205	5.1
Protected Area	21,793	4.2	21,793	4.2
<b>Total</b>	<b>512,333</b>	<b>100</b>	<b>512,333</b>	<b>100</b>

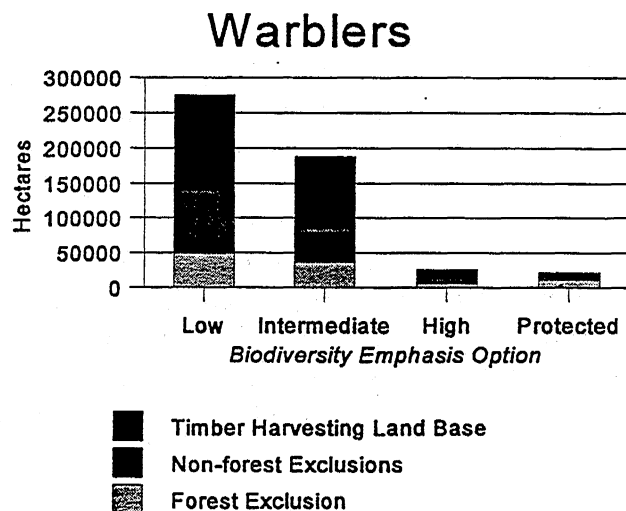


Fig. 7. Distribution of high capability warbler habitat by Biodiversity Emphasis Option. Dawson Creek LRMP. Working Scenario.

*Management Objectives and Strategies* identified by the Dawson Creek LRMP to maintain habitat for Red and Blue-listed warbler species suggests some of the risks may be reduced through landscape and stand-level planning. In addition, recent research on the use of *Wildlife Tree Patches* (WTPs) by forest birds (Seip and Parker 1997) indicated similar detection rates

between mature forests and WTPs which suggested retaining WTPs can provide adequate habitat for some warbler species. This also suggests that retaining suitable WTPs in landscapes units managed to meet Low and Intermediate age class objectives could partly reduce the risks for some species.

Overall, the proposed allocation of BEOs will likely result in increased habitat for warbler species that prefer younger seral forests as well those that can successfully survive in edge-dominated landscapes. However, for species that require large contiguous, mature and old forests, these bird species remain at high risk under both the Base Case and the Working Scenario.

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## **8.0 CONCLUSIONS**

The landscape unit analysis reported here suggests similar conclusions as the previous analysis which focused on the larger LUAs. Overall, the designation of Biodiversity Emphasis Options proposed by the Working Scenario moderately improves the outlook for components of biodiversity including some key wildlife species (e.g., ungulates). However, similar to the previous analysis, warbler species that depend on contiguous patches of mature deciduous forest as well as other wildlife species that require contiguous coniferous forest (e.g., marten) remain at relatively high risks. Careful attention to the distribution of mature forest retention during landscape unit planning may mitigate some of the potential impact and reduce risks associated with reduced amounts of mature forest cover. This may be especially important in landscape units designated as Intermediate BEO. It is unlikely adequate mitigation measures can be taken in Low Biodiversity landscape units which means these landscape units are areas where the highest risks remain and declines to warblers and martens most likely.

Lastly, considerable uncertainty remains regarding the effect of the proposed selective timber harvesting in the ESSF on grizzly bears. In general, this management strategy will pose increased risks to grizzly bears due to an expanded road network, however, strict access management proposed by the Dawson Creek LRMP may be able to partly mitigate potential negative impacts.

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