
State of the Forest

In the Bulkley Timber Supply Area



March 2004

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1.0 Introduction

The Bulkley TSA is entering an exciting time in forestry management, having completed a consensus based Land and Resource Management Plan (LRMP) and detailed landscape unit plans (LUP). Critical to keeping these documents current and relevant is a monitoring and reporting program that assesses their success in delivering intended objectives.

The Bulkley State of the Forest Report (SOFR) fulfils several objectives for the District Stewardship program:

1. presents a reporting format that can be repeated over time to allow trend reporting,
2. presents information that can contribute to updating and amending the LRMP,
3. presents a formal accounting of how objectives in the LUPs are being met,
4. provides information for those licensees pursuing CSA certification, and
5. provides a document that is accessible and understandable to the public.

The SOFR describes the current status of forest-based values in Bulkley Timber Supply Area. A series of indicators have been selected from a wide range of sources and with the collective brainstorming of many local experts in various fields (Appendix 2).

These indicators help quantify what the forest looks like now as a result of forest management practices conducted in adherence to past legislative frameworks. Their choice was dictated by data tracking/information systems in place at the time of analysis, and the types of information routinely collected by agency and licensee staff.

The enactment of the Forest Range and Practices Act (FRPA) has resulted in a new culture of results-based legislation, one of whose pillars include effectiveness evaluations of indicators selected to monitor ongoing forest practices. The District Stewardship program shall continue to monitor current SOFR indicators but will add new ones to reflect:

- changes in licensee operations as a result of managing towards indicators identified in Sustainable Forest Management Plans or certification initiatives; i.e. indicators will be added at such time as licensees modify operational practices to address SFMP/certification indicators and start to track associated data;
- pertinent indicators developed in future at the local, regional or provincial level. The intent is to ensure smooth linkage to other monitoring and evaluation programs including:
 - FRPA Administrative Effectiveness Evaluation Program
 - Ministry of Water, Land and Air Protection biodiversity and environmental monitoring programs;
 - MOF and MWLAP compliance and enforcement programs;
 - Forest Practices Board audits and special investigations;
 - National Criteria and Indicators Reporting; and
 - Provincial State of the Forest Reporting.

It is intended that this report be recompiled every 5 years.

2.0 Biodiversity

2.1 Introduction:

One definition for the term biodiversity is “life in all its forms, and the habitat and natural processes that support it”.

Key pillars of the Bulkley Land and Resource Management Plan are the values of biodiversity and sustainability. This section reports on current performance towards maintenance of landscape-level biodiversity indicators listed in the Bulkley LRMP:

1. ecosystem representation
2. retention of old growth
3. seral stage distribution
4. landscape connectivity
5. temporal and spatial distribution of cutblocks (i.e. patch size distribution)
6. endangered plant and animal life
7. stand structure
8. species composition

2.2 Biodiversity Indicator 1. Ecosystem Representation

2.2.1 Background:

Representation of ecosystems in protected areas was determined. This indicator provides an important baseline on the degree to which ecosystems are protected and where gaps may currently exist. This information also provides an important baseline for monitoring trends over time as the ecosystem network is changed.

The protected land base in the Bulkley is considered to include parks, Special Management Zone 1 and core ecosystems (CE's). Additionally, the contribution from the landscape riparian corridors (LRC's) is calculated given the restrictive prescriptions within this zone. These areas have been chosen because:

- they comprise a connected network of ecosystems;
- the ecosystem network (CE's and LRC) has relatively static boundaries, but the process exists to adjust these boundaries to incorporate important missed elements;
- harvesting is either not permitted or is highly restricted, thus ecosystems will remain in a fairly natural condition over time.

2.2.2 Measure:

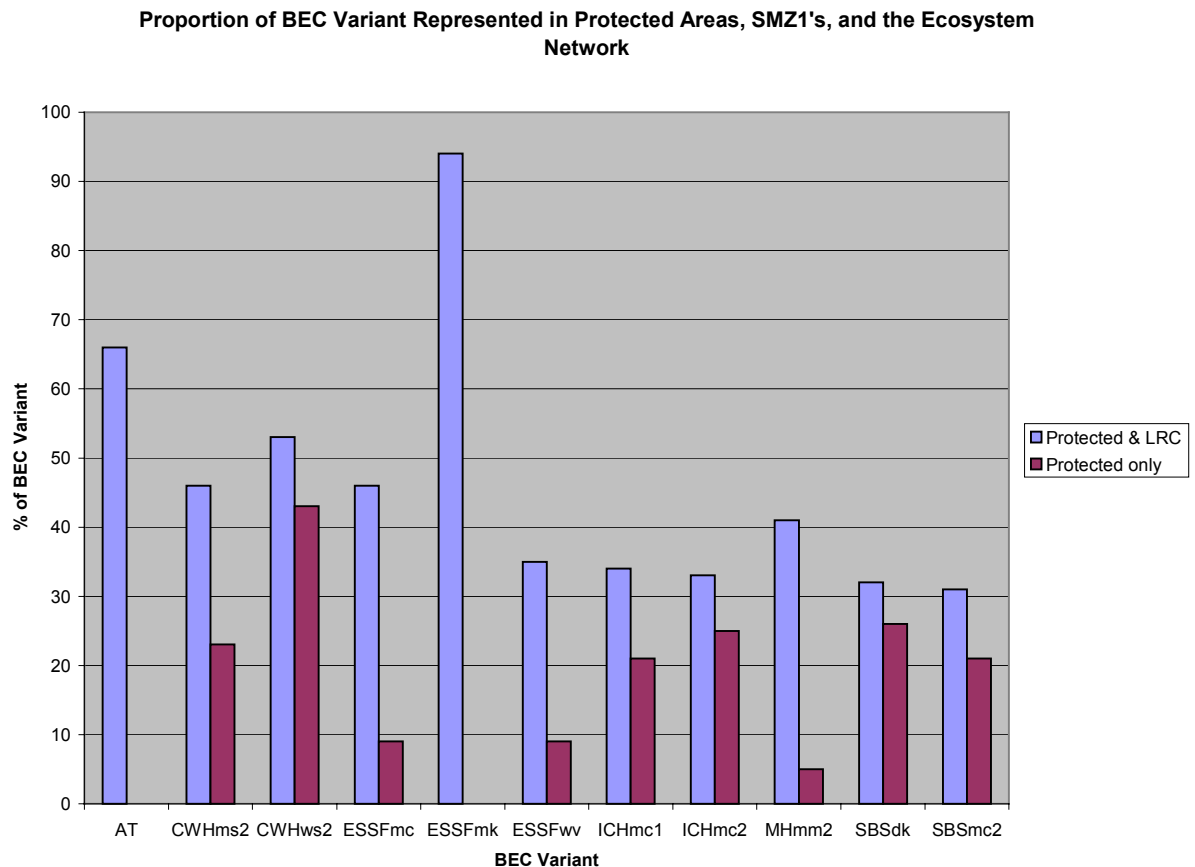
The degree to which all biogeoclimatic ecosystem classification (BEC) variants within Bulkley TSA are represented in protected areas, SMZ1's, and the core ecosystems. Representation in the highly restrictive LRC is also shown.

2.2.3 Results and Discussion:

Figure 1 illustrates the results of an analysis of presence/absence of BEC variants within the areas described ie. Protected Areas and LRCs. The figure shows that all BEC variants are present and are well represented – 31% or more of each BEC variant is within the areas described.

Because restricted harvest is permitted in the LRC, a secondary analysis was run to assess the proportion of BEC variant contained in protected areas. Figure 1 reveals that the degree of representation is significant for CWHws2, ICHmc2, SBSdk and SBSmc2.

Figure 1



2.2.4 Data Sources:

- Ministry of Sustainable Resource Management. October 23, 2001. Biodiversity Indicators in the Bulkley Landscape Units; Part 1: Landscape Level Analysis.
- TSR3 dataset (includes forest cover data current to December 2000)
- Biodiversity Guidebook

2.3 Biodiversity Indicator 2. Core Ecosystems

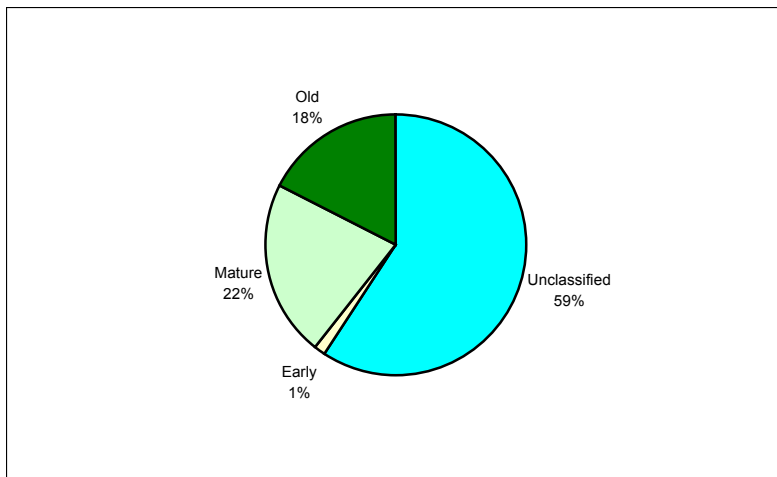
2.3.1 Core Ecosystems

The core ecosystems are designed to assist in meeting the following four objectives:

1. maintain a cross section of ecosystems,
2. retain representative examples of rare and endangered plant communities.
3. retain representative examples of old seral age classes,
4. provide some areas with interior forest conditions,

The core ecosystems contribution to meeting the first 2 objectives are discussed in the Ecosystem Representation and the Retention of Habitat for Endangered Plant and Animal Life sections of this report. The following addresses the remaining 2 objectives.

Figure 2 - Breakdown of Seral Stage Representation in Cores



Seral stages represented in cores show the expected bias towards the mature and old forests with 39% of the total area represent in these two seral stages. In a few minor cases, cores were located over recent fires to allow natural succession patterns to occur.

Figure 3 - Seral Stage Distribution Represented by Cores

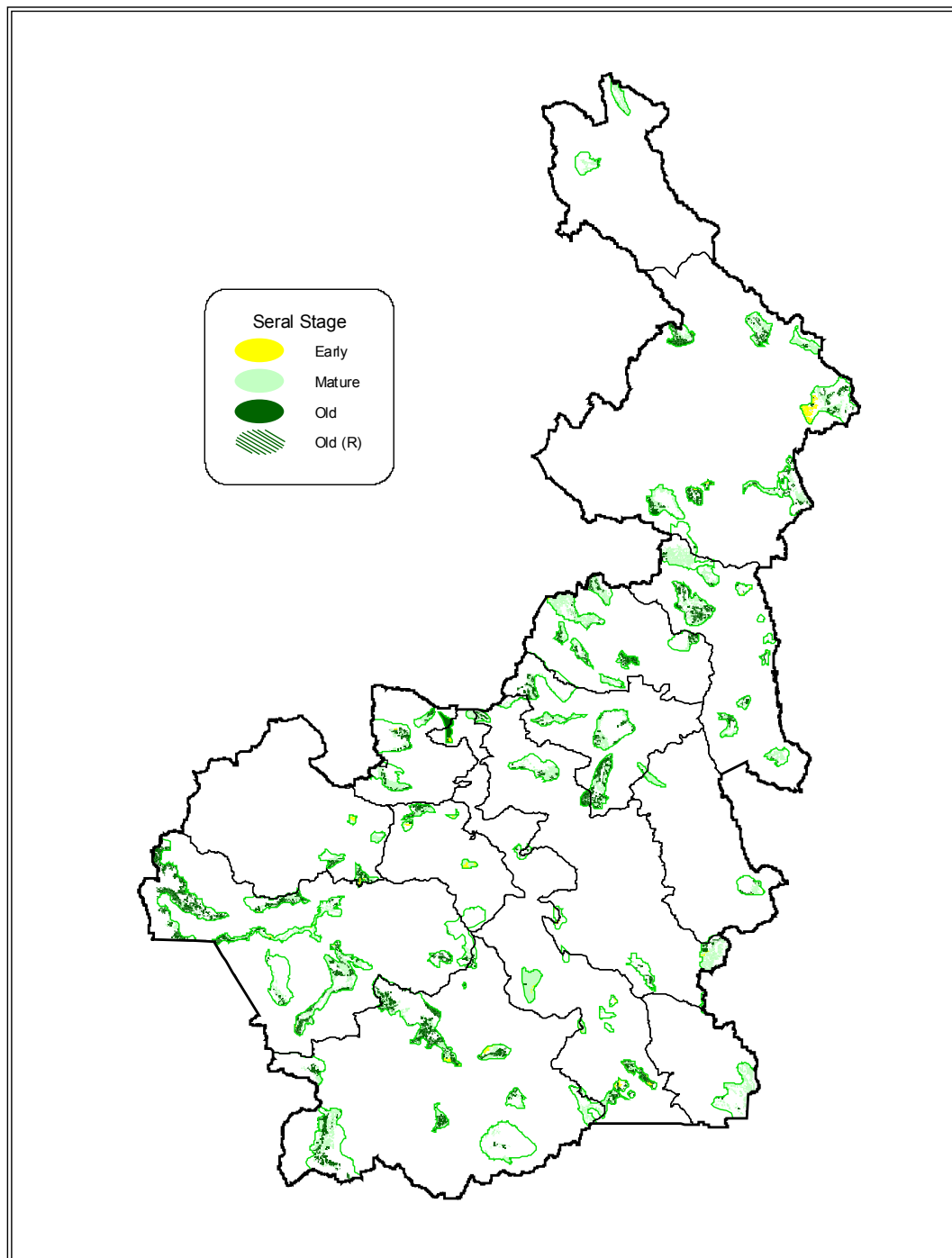
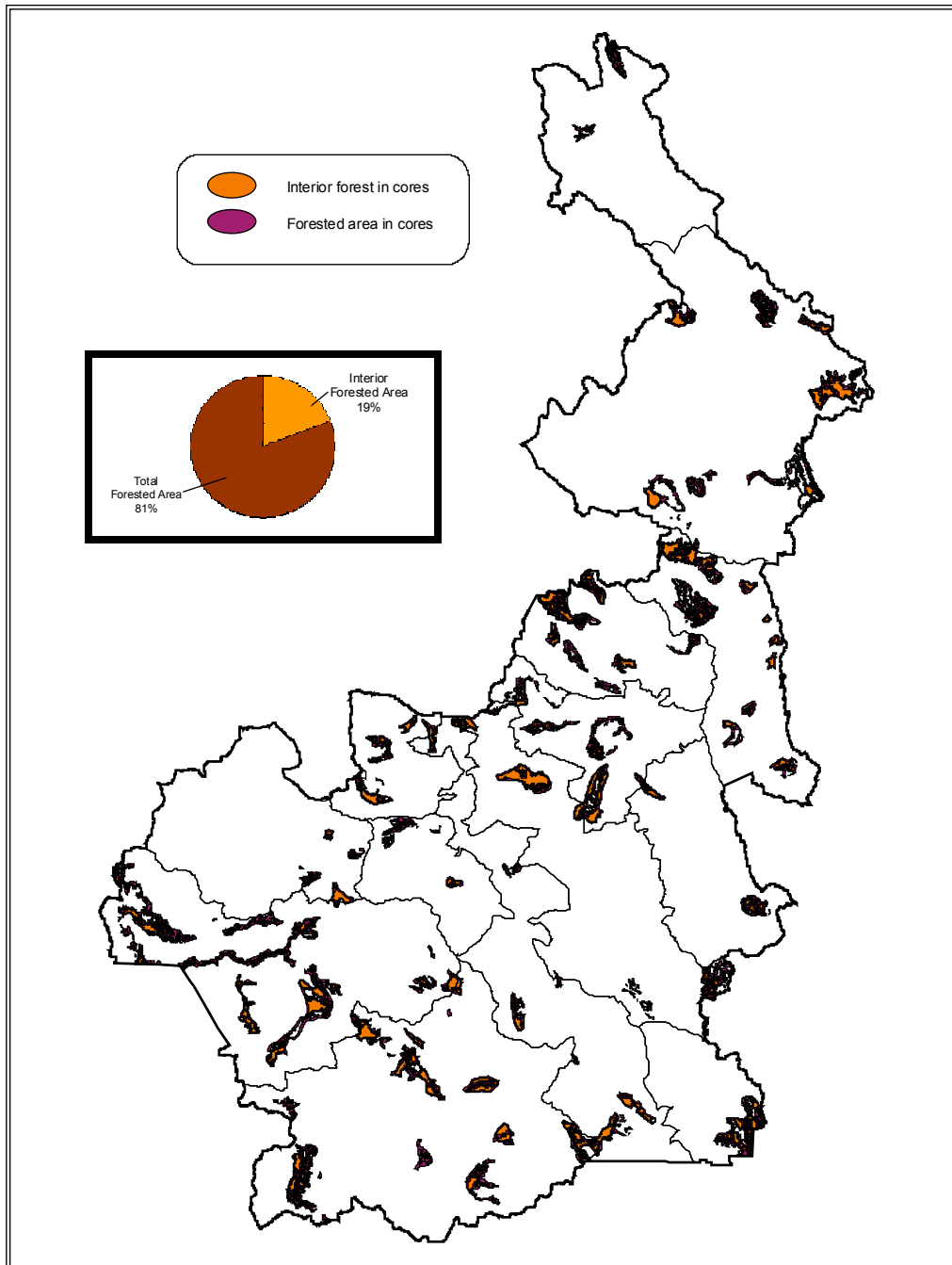


Figure 4 - Interior Forest in Core Ecosystems



Forested area within the core ecosystems was buffered by 200 meters to identify core areas of interior forest conditions¹. Of 67,000 hectares of forested area (across all seral stages) 19% is in interior forested condition. Average size of the interior patches is 33 hectares.

¹ Definition for interior forest conditions comes from the Biodiversity Guidebook (1995)

2.4 Biodiversity Indicator 3. Seral Stage Distribution

2.4.1 Background:

It is believed that the greater the divergence of managed stands from their natural age class or “seral stage” distribution patterns, the greater is the risk of loss to biodiversity. Bulkley Landscape Unit Plans (LUP’s) provide early, [mature plus old] and old seral stage distribution objectives, based on natural disturbance regimes defined by the Biodiversity Guidebook. Seral stage objectives are applicable to the forested portions of biogeoclimatic (BEC) variants within each approved landscape unit: all landscape units and objectives are approved, with the exception of Bulkley and Kitsequecla.

2.4.2 Measure:

Seral stage distribution (of forested area, by BEC variant by Landscape Unit) versus early, mature plus old, and old seral stage objectives for Landscape Units.

2.4.3 Results and Discussion:

Figure 5 illustrates the current seral stage distribution across Bulkley TSA. Table 2 reports the current status of the forested landbase in comparison to seral stage objectives. Instances where objectives are not met or are close to thresholds are highlighted in the table, and also in the figure (for just approved LU’s).

In summary:

- early seral objectives are met in all approved LU’s with the exception of Trout Creek (ICHmc1), Corya (ICHmc2) and Reiserter (ICHmc1).
- mature plus old seral objectives are met across all approved LU’s
- old seral objectives are met in all approved LU’s with the exception of Reiserter (ICHmc2), Corya (ICHmc2), Trout Creek (ICHmc2) and Deep Creek (ESSFmc).

- early seral “objectives” are approaching the threshold for Kitsequecla ICHmc2;
- old seral “objectives” are not achieved in
 - Bulkley ICHmc2, SBSdk and SBSmc2
 - Kitsequecla ESSFmc and ICHmc2.
- In lieu of higher-level plan objectives for the Kitsequecla and Bulkley LU’s, it shall be recommended that the DM consider these results in review of future development/ stewardship plan submissions.

An investigation of age classes was subsequently conducted for those landscape units where the old seral objective was not met. An “old recruitment” category (i.e. one age class below the cutoff for old seral) was identified and investigated, to determine if sufficient old growth is available for recruitment to meet old seral objectives within the next 20 years. The investigation determined that sufficient “old recruitment” was indeed available. Results are displayed in Table 1.

Table 1 – Availability of “Old Recruitment”

LU	BEC variant	Old Seral Objective (%)	Current (%)	Old Recruitment (%)
Bulkley	ICHmc2	>9	3	57
	SBSdk	>11	0	19
	SBSmc2	>11	3	34
Corya	ICHmc2	>13	9	16
Deep Creek	ESSFmc	>9	6	24
Kitseguella	ESSFmc	>9	6	31
	ICHmc2	>9	6	12
Reiseter	ICHmc2	>9	3	38
Trout	ICHmc2	>9	2	20

Source: TSR3 dataset; Biodiversity Indicators in the Bulkley Landscape Units, Appendix 2.

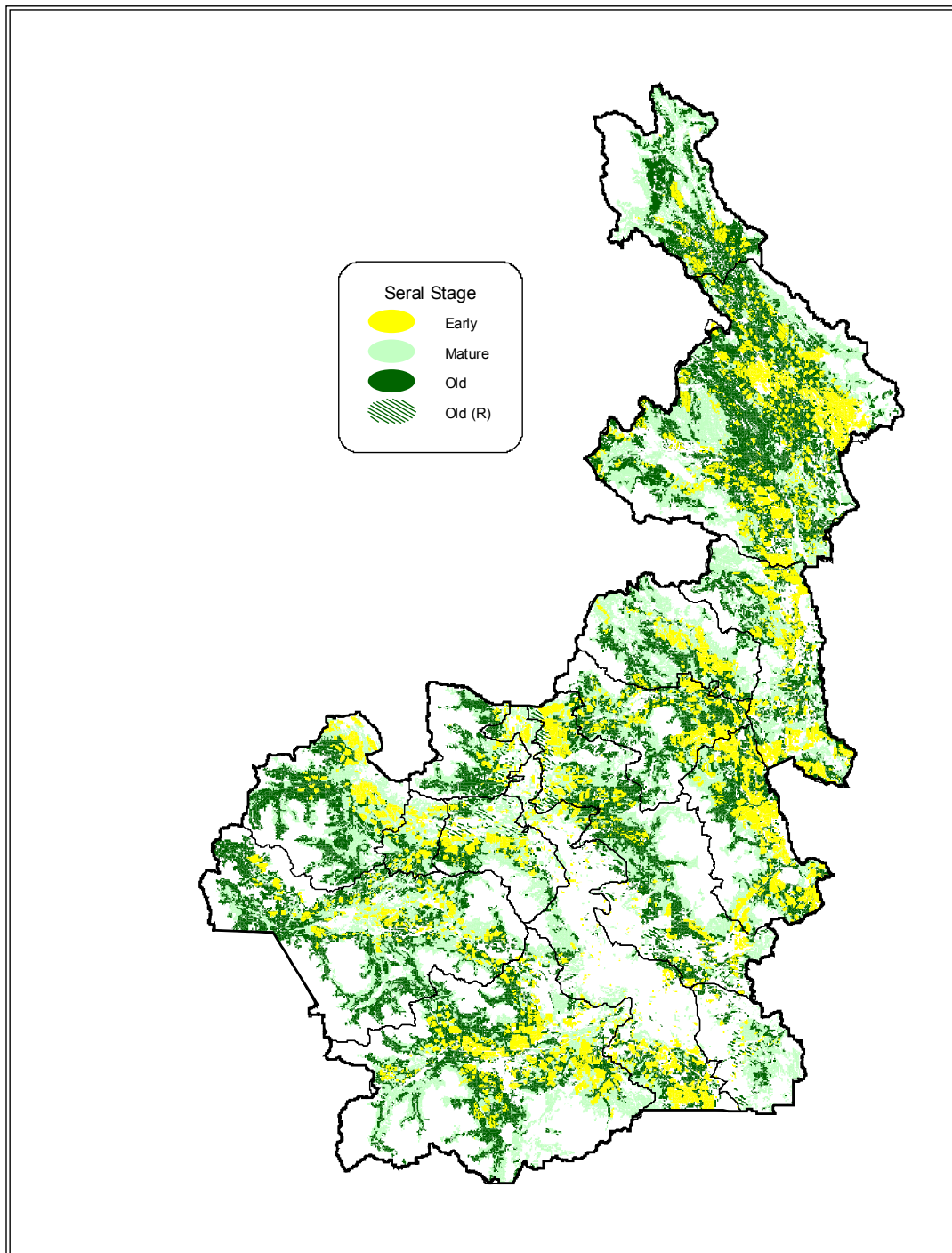
2.4.4 Recommendations

Licensees have been advised that new proposals for clearcut harvest in affected areas will not be approved until such time as seral stage objectives are met. MSRM has been made aware that the LUP for Deep Creek now requires a future amendment to include a recruitment objective for old seral. MRSM shall also be made aware that the future LUP's for Kitseguella and Bulkley landscape units will require old seral recruitment objectives.

2.4.5 Data Sources:

- MSRM, October 23, 2001. Biodiversity Indicators in the Bulkley Landscape Units; Part 1: Landscape Level Analysis.
- TSR3 dataset (includes forest cover data current to December 2000)
- Biodiversity Guidebook
- Bulkley Landscape Unit Plans

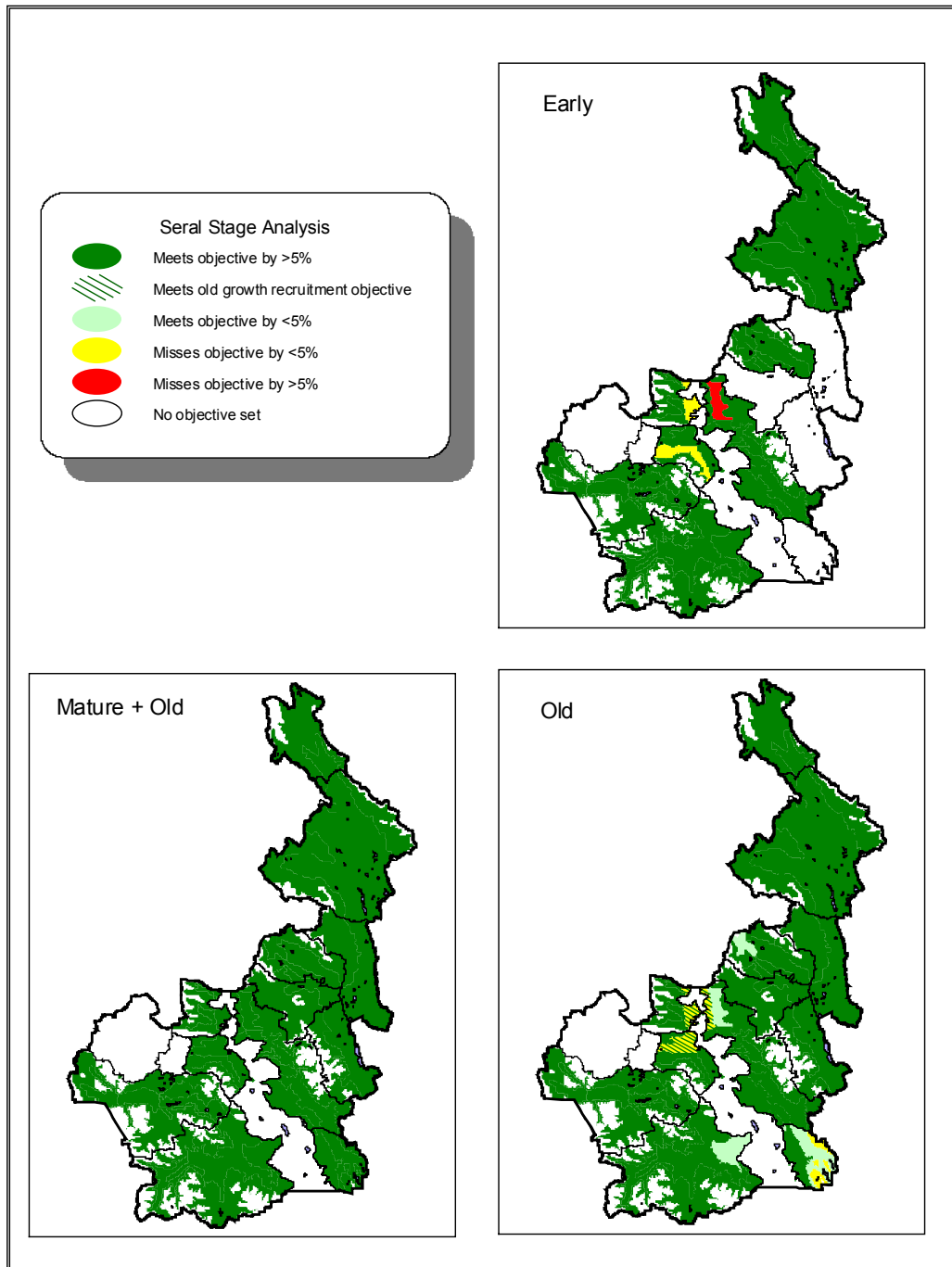
Figure 5 - Seral Stage² Distribution Across the TSA



Source: Biodiversity Indicators in the Bulkley Landscape Units

² Includes FDP data approved in 2000.

Figure 6 - Analysis of Seral Stage Distribution Against LUP Objectives



Source: Biodiversity Indicators in the Bulkley Landscape Units

Table 2 – Comparison of Current Area by Seral Stage with Seral Objectives

LU	BEC Variant	Status of Seral Stages (% of Forested Area)					
		Target Early <40 yrs	Current State	Target Mature+Old*	Current State	Target Old*	Current State
Babine	ESSFmc	<36	15	>28 c	79	>9 e	27
	SBSmc2	<54	28	>23 b	64	>11 d	52
Blunt	ESSFmc	N/a	20	>14 c	76	>9 e	41
	SBSmc2	N/a	40	>11 b	54	>11 d	48
Bulkley ³	ESSFmc	N/a	5	>14 c	86	>9 e	15
	ESSFwv	N/a	0	>19 c	98	>19 e	28
	ICHmc1	N/a	3	>15 b	89	>9 e	26
	ICHmc2	N/a	26	>15 b	50	>9 e	3
	SBSdk	N/a	29	>11 b	38	>11 d	0
	SBSmc2	N/a	17	>11 b	52	>11 d	3
Chapman	ESSFmc	N/a	19	>14 c	77	>9 e	19
	SBSmc2	N/a	50	>11 b	44	>11 d	37
Copper	CWHws2	<36	5	>34 a	94	>9 e	70
	ESSFmc	<36	19	>28 c	70	>9 e	17
	ESSFwv	<22	7	>36 c	87	>19 e	44
	ICHmc1	<36	19	>31 b	62	>9 e	23
	MHm2	<22	9	>36 c	90	>19 e	73
	SBSmc2	<54	25	>23 b	62	>11 d	43
Corya	ESSFmc	<27	0	>42 c	99	>13 e	60
	ESSFwv	<17	3	>54 c	96	>28 e	45
	ICHmc1	<27	10	>46 b	89	>13 e	63
	ICHmc2	<27	30	>46 b	59	>13 e	9
Deep Creek	ESSFmc	N/a	0	>14 c	37	>9 e	6
	SBSdk	N/a	5	>11 b	36	>11 d	12
	SBSmc2	N/a	2	>11 b	55	>11 d	14
Harold Price	ESSFmc	<36	8	>28 c	66	>9 e	17
	ESSFwv	<22	1	>36 c	84	>19 e	29
	ICHmc1	<36	7	>31 b	74	>9 e	11
	SBSmc2	<54	30	>23 b	68	>11 d	41
Kitsegucla ²	CWHms2	<36	4	>34 a	96	>9 e	67
	ESSFmc	<36	13	>28 c	54	>9 e	7
	ESSFwv	<22	3	>36 c	94	>19 e	50
	ICHmc1	<36	24	>31 b	75	>9 e	47
	ICHmc2	<36	34	>31 b	46	>9 e	6
Nilkitkwa	ESSFmc	<27	8	>42 c	87	>13 e	42
	SBSmc2	<40	20	>34 b	78	>16 d	69
Reiseter	ESSFmc	<36	8	>28 c	82	>9 e	25
	ICHmc1	<36	49	>31 b	39	>9 e	11
	ICHmc2	<36	22	>31 b	55	>9 e	3
	SBSdk	<54	9	>23 b	65	>11 d	37
	SBSmc2	<54	18	>23 b	64	>11 d	53
Telkwa	CWHws2	<36	12	>34 a	86	>9 e	39
	ESSFmc	<36	8	>28 c	72	>9 e	27
	ESSFmk	<36	0	>28 c	98	>9 e	25
	ESSFwv	<22	13	>36 c	82	>19 e	50
	SBSdk	<54	29	>23 b	53	>11 d	15
	SBSmc2	<54	30	>23 b	47	>11 d	35
Torkelson	ESSFmc	N/a	14	>14 c	67	>9 e	26
	SBSmc2	N/a	32	>11 b	46	>11 d	25
Trout	ESSFmc	<36	12	>28 c	73	>9 e	43
	ESSFwv	<22	5	>36 c	94	>19 e	29
	ICHmc1	<36	39	>31 b	58	>9 e	24
	ICHmc2	<36	15	>31 b	65	>9 e	2
	SBSdk	<54	17	>23 b	59	>11 d	38

*Lower age limit for seral stage: a = 80 years; b = 100; c = 120; d = 140; e = 250

Source: Biodiversity Indicators in the Bulkley Landscape Units, Appendix 2; and TSR3 dataset

³ Seral objectives for Bulkley and Kitsegucla landscape units are presently not approved. Table 2 reports the current status of the forested landbase against “objectives” as they would be if defined using a technique reflective of that for approved landscape units.

2.5 Biodiversity Indicator 4. Landscape Connectivity

2.5.1 Background:

“Landscape connectivity” is achieved in Bulkley TSA by management of spatially-defined linear, forested networks (i.e. Landscape Riparian Corridors – LRC’s). These networks incorporate riparian areas for major streams and rivers, and provide linking forest between protected areas, CE’s and SMZ1’s within Bulkley’s protective network (see Biodiversity Indicator 1).

As stated in Bulkley LUP’s, it was intended that LRC’s be dominated by mature tree cover, and contain “functional old forest” that provides habitat connectivity and permits movement and dispersal of plant and animal species. “Functional old forest” is defined for analysis purposes as forest that is constrained such that 70% must be greater than 80 years old (i.e. up to 30% harvest is permitted within the LRC over an 80 year period). The harvest pattern must be generally distributed, in blocks of 3 hectares or less.

2.5.2 Measure:

Current status of LRC’s with respect to achieving a mature forest objective where 70% of the corridor must be greater than 80 years old.

2.5.3 Results and Discussion:

A GIS exercise was conducted to divide the LRC into logical individual corridors, and determine which of these corridors did or didn’t meet the mature forest objective. Figure 7 illustrates the results of this analysis.

Subsequent analysis revealed that the reason many corridors did not meet the mature forest objective was not because of recent harvest, but because early to mid seral forest was originally included in the LRC.

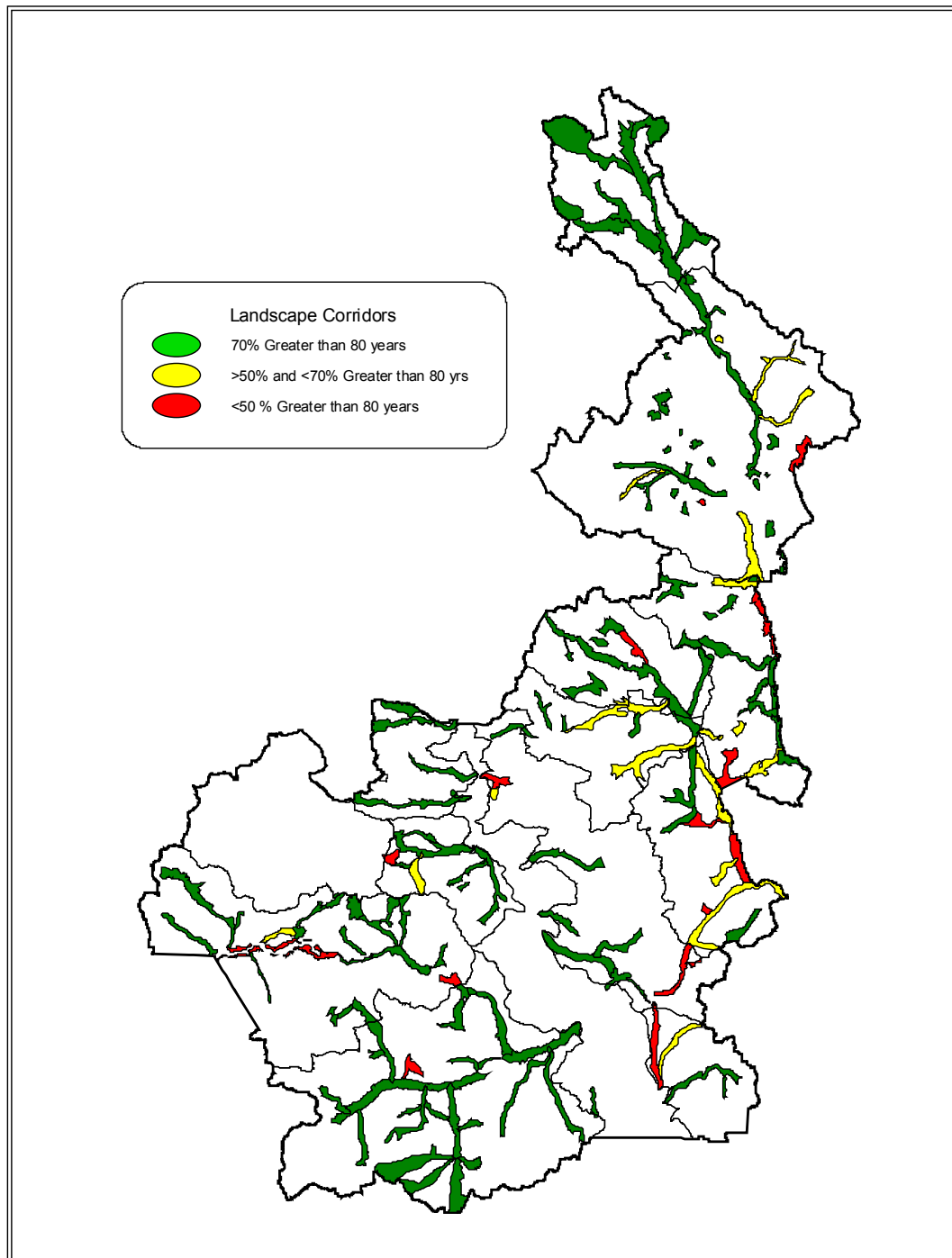
2.5.4 Recommendations

It has been recommended to licensees that no harvest be proposed in the corridors identified in yellow and red, until such time as the mature forest objective is achieved.

2.5.5 Data Sources:

- Ministry of Sustainable Resource Management. October 23, 2001. Biodiversity Indicators in the Bulkley Landscape Units; Part 1: Landscape Level Analysis.
- TSR3 dataset (includes forest cover data current to December 2000)
- Biodiversity Guidebook
- Bulkley Landscape Unit Plans

Figure 7 - Mature Forest Analysis in Landscape Corridors



2.6 Biodiversity Indicator 5. Patch Size Distribution

2.6.1 Background:

Natural forests are characterized by stand-initiating disturbances (e.g. wildfire, windstorms, insect outbreaks, etc.) that create a progression of canopy gaps or stand openings over time. From a forest management perspective, this aspect of biodiversity is addressed by using a harvest pattern that mimics the temporal and spatial nature of natural disturbances.

The frequency and size of disturbance events are closely linked to ecosystem type. The Biodiversity Guidebook broadly groups ecosystems into five “natural disturbance types” (NDT’s):

- NDT1 – ecosystems in which disturbances (e.g. fire, blowdown, mortality due to large-scale insect attack) that result in natural openings rarely occur. These are predominately wetter, coastal or high elevation ecosystems.
- NDT2 – ecosystems in which disturbances occur infrequently
- NDT3 – ecosystems in which disturbances occur frequently
- NDT4 – grassland, shrubland and forested ecosystems that experience frequent low-intensity “stand-maintaining” fires
- NDT5 – Alpine Tundra and Subalpine Parkland ecosystems

Bulkley Landscape Unit Plans (LUP’s) provide small, medium and large patch size distribution objectives that are applicable to the forested portions of NDT’s within each approved landscape unit (Table 3). The intent is for objectives to be met by the end of the rotation period, which is commonly 60 or more years in the future.

To serve analysis and for simplicity, a “patch” is considered to be comprised of areas recently disturbed (i.e. less than 40 years of age) by either harvesting or fire, that are contiguous and within the same 20-year age class. A patch persists through time to the end of the rotation period.

2.6.2 Measure:

Current patch size distribution (forested area, by NDT by Landscape Unit) versus patch size distribution objectives as defined by approved Bulkley Landscape Unit Plans.

2.6.3 Results and Discussion:

Figure 8 displays the current patch size distribution across Bulkley TSA. Table 3 and Figure 9 present the results from current and “near future” (i.e. by the completion of recently proposed development) patch size analyses.

Table 3 – Comparison of Current and Near Future Patch Size Distribution against LUP Objectives

Landscape Unit	NDT	Small Patch Objective (%)	Current % (as of 2000)	Near Future % (by 2009)	Medium Patch Obj (%)	Current %	Near Future %	Large Patch Obj (%)	Current %	Near Future %
Babine	2	30-40	4	6	30-40	3	4	20-40	7	14
	3	10-20	8	10	10-20	11	16	60-80	11	12
Blunt	2	30-40	7	7	30-40	3	6	20-40	9	16
	3	10-20	5	7	10-20	12	14	60-80	22	22
Bulkley*	1	30-40	0	0	30-40	0	0	20-40	0	0
	2	30-40	11	19	30-40	11	13	20-40	9	9
	3	10-30	15	15	10-30	18	19	50-80	16	16
Chapman	2	30-40	4	5	30-40	3	6	20-40	15	25
	3	10-20	5	5	10-20	18	17	60-80	30	35
Copper	1	30-40	4	6	30-40	3	5	20-40	1	4
	2	30-40	8	9	30-40	7	8	20-40	1	6
	3	10-30	15	15	10-30	11	15	50-80	0	0
Corya	1	30-40	1	1	30-40	0	0	20-40	7	7
	2	30-40	10	12	30-40	4	4	20-40	6	6
Deep Ck	2	30-40	0	0	30-40	0	0	20-40	0	0
	3	10-20	10	11	10-20	5	5	60-80	0	0
Harold Price	1	30-40	0	1	30-40	0	0	20-40	0	0
	2	30-40	2	5	30-40	1	6	20-40	2	2
	3	10-20	3	6	10-20	7	8	60-80	20	21
Kitsegucla*	1	30-40	5	5	30-40	1	1	20-40	0	1
	2	30-40	5	6	30-40	12	12	20-40	18	20
Nilkitkwa	2	30-40	3	3	30-40	2	1	20-40	0	15
	3	10-20	3	10	10-20	3	10	60-80	0	9
Reiseter	2	30-40	7	8	30-40	3	5	20-40	16	22
	3	10-20	13	16	10-20	18	23	60-80	0	0
Telkwa	1	30-40	7	6	30-40	15	21	20-40	0	4
	2	30-40	4	6	30-40	2	5	20-40	0	6
	3	10-20	6	7	10-20	16	17	60-80	11	15
Torkelson	2	30-40	3	4	30-40	7	4	20-40	4	16
	3	10-20	6	6	10-20	17	15	60-80	17	26
Trout Ck	1	30-40	10	15	30-40	0	0	20-40	0	0
	2	30-40	13	13	30-40	11	10	20-40	22	28
	3	10-20	25	29	10-20	33	33	60-80	0	0

* Bulkley and Kitsegucla landscape units and objectives are not approved. Figures shown in table are for information only.

Source: Biodiversity Indicators in the Bulkley Landscape Units, Appendix 3

2.6.4 Recommendations

In summary, for NDT's highlighted in yellow in Table 3:

- Trout Creek NDT3 – the small and medium patch size objectives have been exceeded, and the large patch objective under achieved. Achievement of the large patch objective is infeasible because of the small timber harvesting landbase (THLB) size for NDT3 (500 ha). It is recommended that licensees avoid harvest in NDT3 for the balance of the rotation, and concentrate harvest in small and medium patches in NDT 1 and 2 (within objective limits).
- Reiserter NDT3 - the medium patch size objective would be exceeded if near-future harvest was conducted as proposed. A recommendation has been made to licensees that they withdraw certain proposed blocks and aggregate recently harvested medium patches into large patches.

In summary, for NDT's highlighted in green in Table 3:

- objectives are achieved for one or more patch size types (or will be following completion of near-future harvest). It is recommended that future harvest proposals target those patch size types where objectives have yet to be achieved.

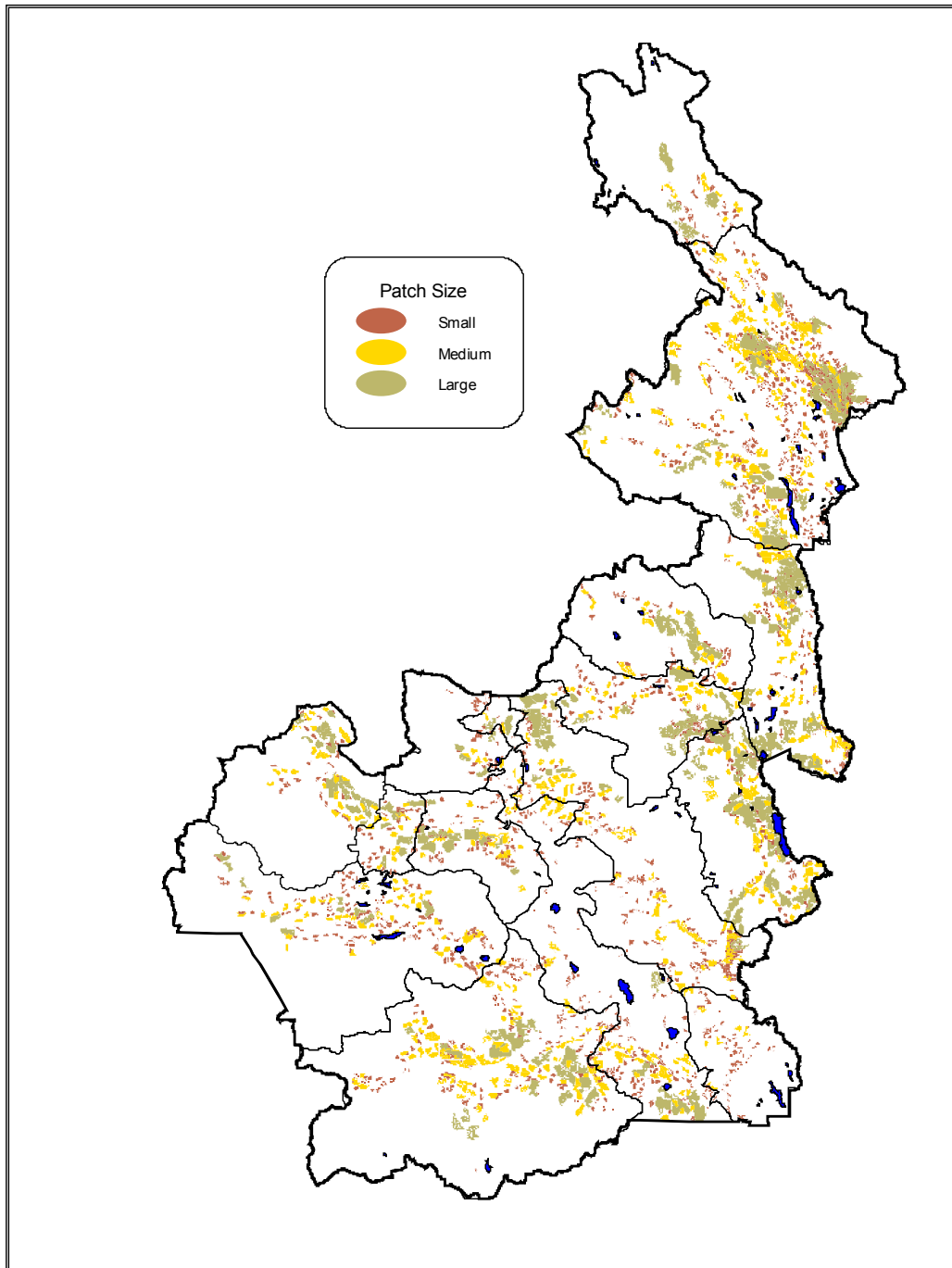
None of the remaining NDT's have achieved patch size objectives. This is an artefact of the definition for a patch: patches are comprised only of recently disturbed areas, and some NDT's have low levels of disturbance at present. The intent is that objectives will be achieved over time as more and more of the NDT becomes disturbed

As more of the forested landbase is developed or disturbed in future years, it will become clearer if meeting the large patch objective is feasible. Topography, timber types, development emphasis and social values may make achievement impossible. Effort shall be made in future analyses to assess the feasibility of large patch objectives, with the aim of potential modification to address localized conditions.

2.6.5 Data Sources:

- Ministry of Sustainable Resource Management. October 23, 2001. Biodiversity Indicators in the Bulkley Landscape Units; Part 1: Landscape Level Analysis.
- TSR3 dataset (includes forest cover data current to December 2000)
- Biodiversity Guidebook (September 1995)

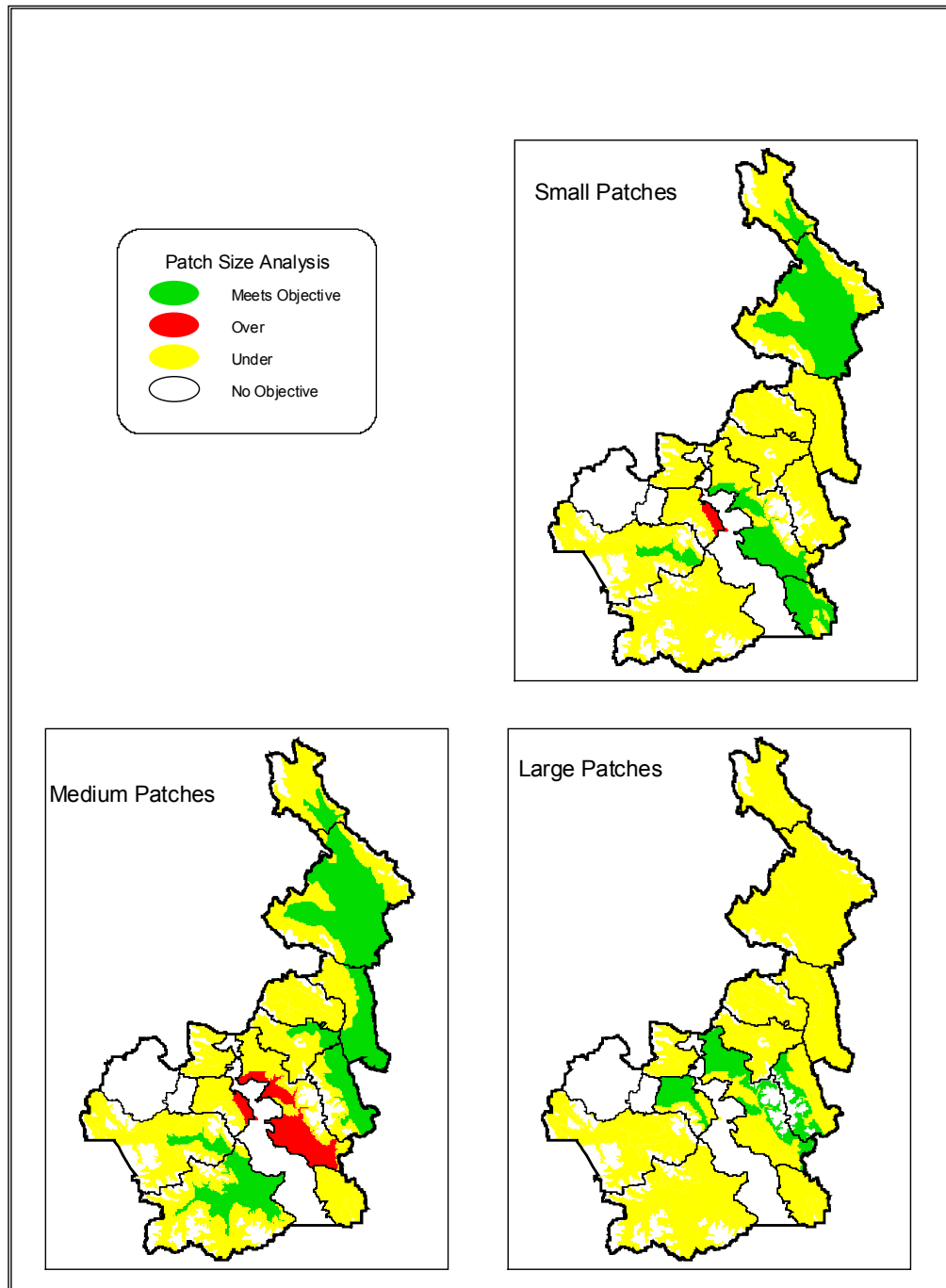
Figure 8 - Patch Size Distribution Across the Bulkley TSA



¹ Incorporates 2000 Forest Development Plan data.

Source: Biodiversity Indicators in the Bulkley Landscape Units

Figure 9 - Analysis of Patch Size Distribution



Source: Biodiversity Indicators in the Bulkley Landscape Unit

2.7. Biodiversity Indicator 6. [Retention of Habitat for] Endangered Plant and Animal Life

2.7.1 Background:

Retention of habitat for endangered animal life is discussed in Wildlife Indicator 1. This biodiversity indicator focuses on the status of accommodation for rare and endangered plant communities (i.e. red- or blue-listed by the BC Conservation Data Centre - BCCDC).

LUP direction is to “retain representative examples of rare and endangered plant communities within Core Ecosystems”. Protected areas (i.e. parks, ecological reserves) and SMZ1’s also contribute to protection of rare and endangered ecosystems.

Until recently, assessment of timber supply area (TSA)-level accommodation for rare and endangered plant communities (i.e. ecosystems) has been infeasible because site-level ecosystem mapping was unavailable for the TSA as a whole. Rare and endangered plants and plant communities listed in Landscape Unit Plans (LUP’s) were identified at the block layout stage, and accommodated through boundary adjustment or Wildlife Tree Patch placement (Doug Witala, pers comm).

The final draft completion of two projects have improved the situation:

- Rare Plant Communities and Plant Species within the Bulkley portion of the Bulkley-Cassiar Forest District (Skeena Forestry Consultants, 1998), which mapped a selection of red and blue-listed communities in the southern half of the TSA
- Predictive Ecosystem Mapping (PEM) for Bulkley TSA (Ministry of Forests, 2002), which can be used to predict the spatial location of certain rare and endangered plant communities.

Based on this information, representation of known and predicted occurrences of rare and endangered plant communities shall be assessed.

2.7.2 Measure:

Known and predicted locations of rare and endangered plant communities versus proportion (by area) contained within core ecosystems, protected areas, and SMZ1’s.

2.7.3 Results and Discussion:

Table 4 lists rare and endangered plant communities identified by the BC Conservation Data Centre and Skeena Forest Consultants (1998), and provides the BC ranking (red- or blue-listed). The table includes the PEM site series or site code that has been selected to represent the sensitive community. A field with “site series identifier” numbers has been added, which is referenced both in Figure 10 and the discussion.

Figure 10 illustrates the proportion by area of rare and endangered ecosystems contained within Core Ecosystems, protected areas and SMZ1’s. For purposes of this discussion, these areas shall be referenced as Protective Areas or **PA’s**. In summary, site series identifiers 1, 2, 8, 16, 17 and 23 are not present in PA’s (or PEM is unable to predict their location), and identifiers 3, 4, 10, 11, 13, 14, 28 and 29 have 10% or less representation.

Table 4 – Rare and Endangered Plant Communities, Bulkley Timber Supply Area

Rare and Endangered Plant Communities	BC Ranking	PEM Site Series/Code	Site Series Identifier*
Amabilis Fir/Western Red Cedar - Devil's Club, Wet Submaritime	Blue	CWHws2/06	1
Amabilis Fir/Western Red Cedar - Oak Fern	Blue	CWHws2/04	2
Black Cottonwood - Hybrid White Spruce - red osier dogwood - prickly rose floodplains	(Blue)	SBSdk/08	3
Black Spruce - hybrid white spruce - scrub birch - sedge	Blue (RED)	ICHmc2/08	4
Black Spruce/Lodgepole Pine - Feathermoss	Blue	SBSmc2/03	5
Bluegrass - Slender Wheatgrass	RED	SBSdk/82	6
Bracken - cow parsnip - rice root meadow	(Blue)	(ICHmc2 - PEM code ME)	7
Cottonwood - Dogwood - Prickly Rose	RED	SBSdk/08	8
Cottonwood - Red Osier Dogwood	Blue	CWHws2/08	9
Cow parsnip - large leaved avens - stinging nettle - brome lush meadows	(Blue)	(SBSdk, mc2, ESSFmc, ICHmc1, mc2, CWHws2 - PEM code CP)	10
Douglas-Fir - Feathermoss - Stepmoss	Blue	SBSdk/04	11
Hybrid Spruce - paper birch - devil's club - lady fern	Blue	ICHmc2/54	12
Hybrid Spruce - twinberry - coltsfoot	Blue	ICHmc2/51; SBSdk/06; SBSmc2/05	13
Hybrid White Spruce - Horsetail floodplain forest	(RED)	SBSdk/07	14
Lodgepole Pine - Juniper - Ricegrass	Blue	SBSdk/02	15
Lodgepole Pine - Kinnikinnick	RED	CWHws2/02	16
Lodgepole Pine - Sphagnum, Wet Submaritime 2	Blue	CWHws2/10	17
Mesic (montane) forb meadows - variable spp. Composition	RED (Blue)	(SBSdk, mc2, ICHmc2 - PEM code HM)	18
Pacific willow - Mountain Alder - Lady Fern	(Blue)	(SBS dk, mc2 - PEM code AW)	19
Paper Birch - Black Twinberry Fluvial Forest	(RED)	SBSdk/\$58	20
Saskatoon-Slender Wheat Grass	RED	SBSdk/81; ICHmc2/81	21
Sitka Spruce - Salmonberry, wet submaritime 2	RED	CWHws2/07	22
Subalpine Fir - Huckleberry - Crowberry	Blue	ESSFmc/03	23
Subalpine Fir/Lodgepole Pine - Cladonia	Blue	ESSFwv/02	24
Subalpine Fir/Lodgepole Pine - Juniper - Lichen	Blue	ESSFmc/02	25
Subalpine Fir/Whitebark Pine - Cladonia	Blue	ESSFmk/02; ESSFmk/03	26
Timber Oatgrass dry grassland	RED (Blue)	(SBSmc2, ESSFmc - PEM code HG)	27
Trembling Aspen - paper birch - beaked hazelnut - red osier dogwood	(Blue)	ICHmc2/52, 53	28
Western Hemlock - Azalea - Skunk Cabbage	Blue	ICHmc1/06	29
Western Hemlock - Kinnikinnick - Cladonia	Blue	ICHmc1/02; ICHmc2/02	30
Western Red Cedar/Hybrid White Spruce - Devil's Club - Horsetail	Blue	ICHmc2/07	31
Whitebark Pine/Cladonia - Dicranum	Blue	ESSFmk/02; ESSFmk/03	32

Italic = rare and endangered as listed by the BC Conservation Data Centre. Remainder are rare and endangered as identified by Skeena Forest Consultants

(...) = provincial ranking suggested by Skeena Forest Consultants

* **bold** identifiers were neither predicted by PEM as being present, nor were mapped by Skeena Forest Consultants

There are certain areas outside of PA's where harvest-related disturbance is unlikely to occur. These include non-forested areas and certain non-productive forested areas (i.e. private lands, gravel pits, open range and urban areas) that are normally excluded from the Timber Harvesting Landbase. Figure 10 also illustrates the proportion (by area) of rare and endangered ecosystems that are protected in the combination of these areas and PA's. In summary, site series identifiers 1, 2, 16, 17 and 23 are not present (or PEM is unable to predict their location), and identifiers 3, 8, 11, 13, 131, 14 and 28 have 10% or less representation.

So in summary, identifiers 1, 2, 3, 8, 10, 11, 13, 14, 16, 17, 23, 26, 28 and 29 are either poorly represented or PEM is unable to predict their location. Of this list, PEM is able to predict locations for site identifiers 3, 8, 10, 11, 13, 14, 28 and 29. Figure 11 shows the location of under-represented sites that PEM is able to predict, with the exception of site identifier 13.

Site identifier 13 is not displayed because it comprises a large area (93,890 ha) and these are supposedly rare and endangered types. It was discovered that the logic equations used in PEM do not necessarily predict one site series uniquely: sometimes site series "ties" occur. Allan Banner (pers comm October 3, 2003) suggested that site identifier 13 types with no site series "ties" may be a more realistic representation. Of the types associated with site identifier 13 (see Table 4), only SBSdk/06 had instances with no "ties", and the area represented was still quite extensive (20,491 ha).

2.7.4 Recommendations

The following recommendations have therefore been made:

- SRM/MOF to ensure any future adjustment of Core Ecosystem boundaries focuses on including examples of these plant communities.
- Licensees to ensure PEM/ Skeena Forest Consultants mapping of existing or potential rare and endangered plant communities is used as a planning layer for Forest Development Plan/Forest Stewardship Plan development.
- PEM developers to revisit the logic tables for SBSdk/06, SBSmc2/05 and ICHmc2/51 (i.e. site identifier 13) to re-evaluate parameters used to predict the location of these rare and endangered types.

2.7.5 Data Sources:

- Ministry of Sustainable Resource Management. October 23, 2001. Biodiversity Indicators in the Bulkley Landscape Units; Part 1: Landscape Level Analysis.
- TSR3 dataset (includes forest cover data current to December 2000)
- Biodiversity Guidebook
- Bulkley Landscape Unit Plans

Personal Communications:

- Doug Witala, Planning Forester, Pacific Inland Resources
- Alan Banner, Regional Ecologist, Coastal Forest Region

Figure 10 - Protection of Rare and Endangered Ecosystems

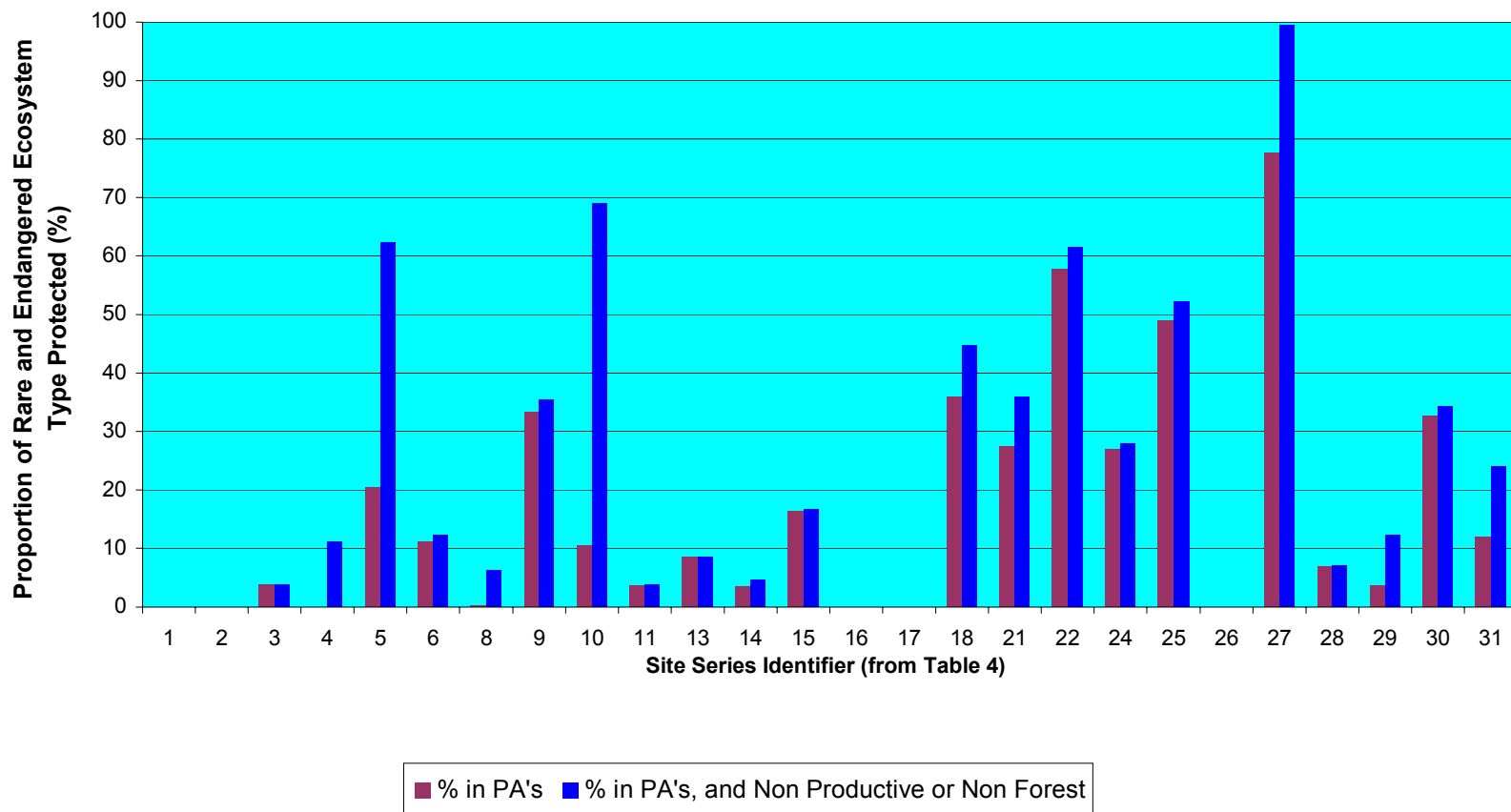
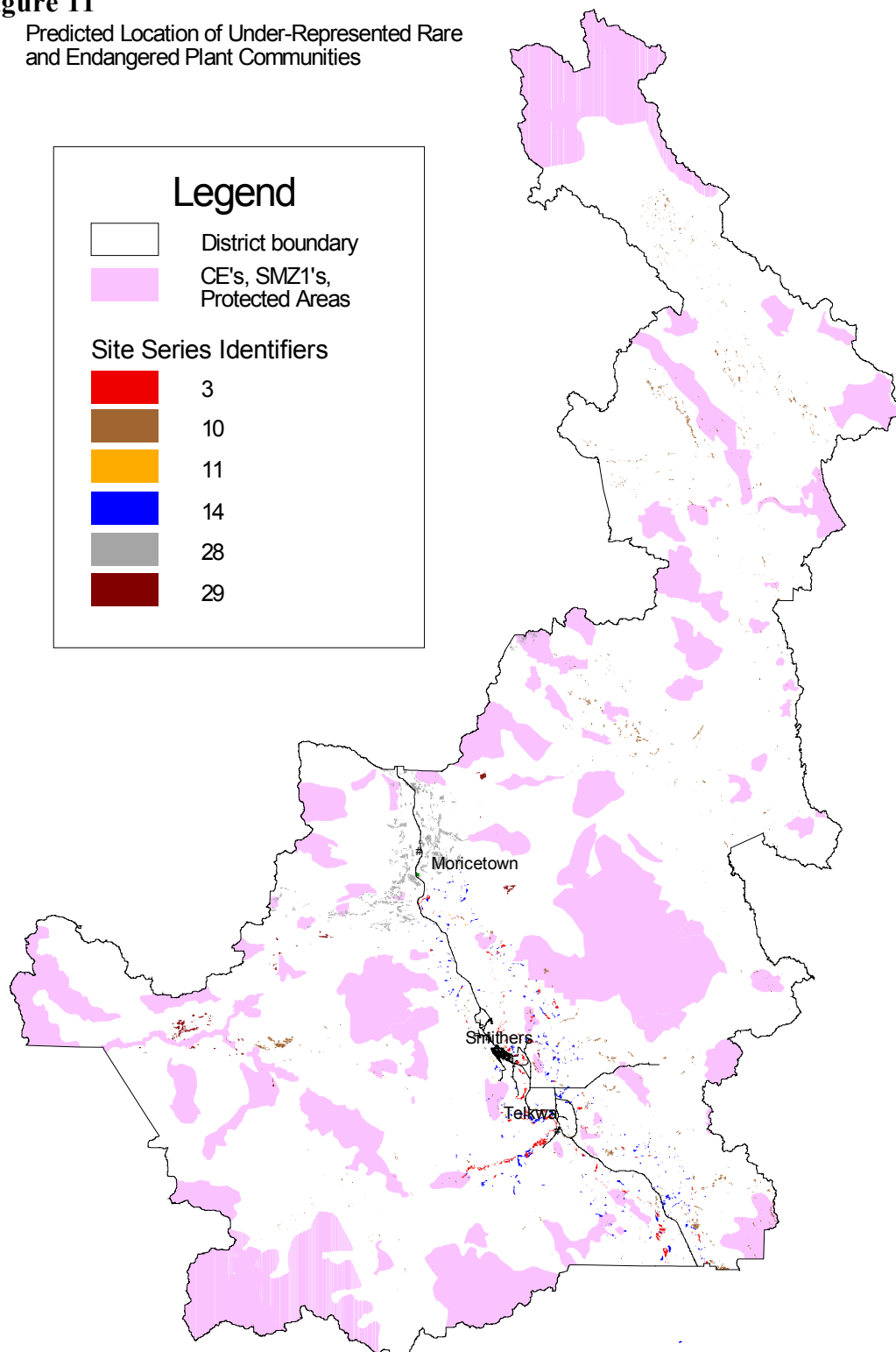


Figure 11

Predicted Location of Under-Represented Rare and Endangered Plant Communities



2.8 Biodiversity Indicator 7. Stand Structure

2.8.1 Background:

Maintaining stand structure involves providing structural diversity within managed stands, by retaining attributes of old growth forest including coarse woody debris (CWD), standing dead, standing live, connectivity, and riparian structure. Attributes of old growth forest are retained at the block level within wildlife tree patches (WTP's), riparian reserves, temporary reserves, and to some extent by individual residual stems.

2.8.2 Measure:

Comparison of actual WTP area against WTP targets established in Bulkley Landscape Unit Plans.

2.8.3 Results and Discussion:

Table 5 and Figure 12 compare actual wildlife tree patch (WTP) and reserve percent (as tracked in the MOF's "Integrated Silviculture Inventory System" - ISIS) against WTP targets established in Bulkley's Landscape Unit Plans (LUP's). Because WTP targets differ by landscape unit, area-weighted targets are provided to facilitate comparisons at the biogeoclimatic ecosystem classification (BEC) variant level.

[WTP/Reserve %] figures from Table 5 are based on [total area in WTP and reserve] over [total harvest area], summed to the BEC variant level.

Table 5 – Actual Area in WTP and Reserves Versus Landscape Unit Plan WTP Targets

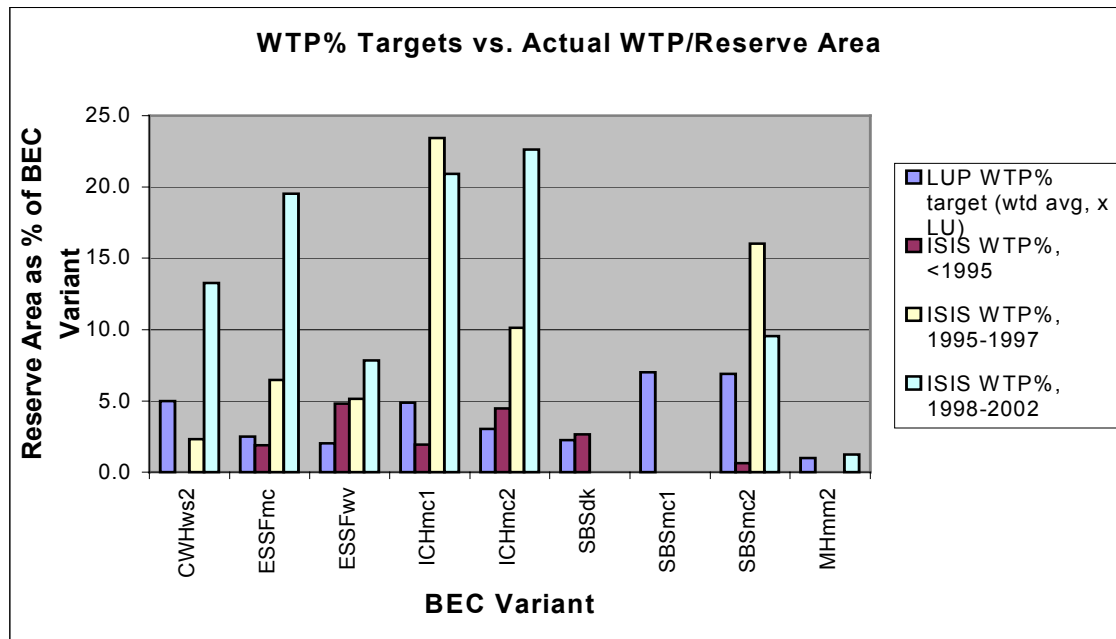
BEC variant	LUP WTP% target (wtd avg, x LU)	WTP/Reserve % <1995*	WTP/Reserve % 1995-1997	WTP/Reserve % > 1998**
CWHws2	5.0	0.0	2.3	13.3
ESSFmc	2.5	1.9	6.5	19.5
ESSFwv	2.0	4.8	5.2	7.8
ICHmc1	4.9	1.9	23.4	20.9
ICHmc2	3.0	4.5	10.1	22.6
SBSdk	2.3	2.7	No harvest^	No harvest^
SBSmc1	7.0	0.0	0.0	No harvest^
SBSmc2	6.9	0.6	16.0	9.5
MHmm2	1.0	0.0	No harvest^	1.2

* Prior to implementation of Forest Practices Code

** After establishment of Bulkley LUP's

^ ISIS records indicate no harvest in BEC variant during period of interest

Figure 12 – Actual Area in WTP and Reserves Versus Landscape Unit Plan WTP Targets



The table and figure reflect a general trend towards increased area in permanent (i.e. WTP, riparian reserve) and temporary reserve by BEC variant over the three periods considered. These trends are attributable to the new culture of managing to WTP targets from LUP's, and the trend to larger aggregate block designs with a high proportion of temporary reserves.

Figure 12 appears to indicate that WTP targets are being overachieved in recent years. However, it must be emphasised that “temporary reserves” are indeed temporary in duration. While permanent reserves are meant to persist to the end of the rotation period (i.e. until the next harvest of mature timber from the same area), temporary reserves are designated for harvest at an earlier point in the rotation.

2.8.4 Recommendations

It is permanent reserve area that should be compared against the WTP target. Unfortunately, ISIS does not allow permanent reserve (i.e. WTP and riparian reserve) to be differentiated from temporary reserve, which hampers proper interpretation of results. This problem has been noted, and identified as an MOF District priority to rectify by the time the next State of Forest Report is prepared.

2.8.5 Data sources:

Ministry of Forests Integrated Silviculture Information System (ISIS)

BECdb (a provincial database enabling conversion of BEC codes from all previous versions to current version)

2.9 Biodiversity Indicator 8. Species Composition

2.9.1 Background:

The intent of this LRMP biodiversity indicator is clarified by Bulkley Landscape Unit Plans as being to “maintain a diversity of coniferous and deciduous species that represents the natural species composition of each BEC subzone”.

2.9.1 Measure:

A comparison of [tree species present on existing plantations] against [tree species representation in undisturbed forest in the BEC subzone].

2.9.2 Results:

Prior to introduction and discussion of the results, two provisos must be considered:

- Most openings were created prior to 1998, when Landscape Unit Plans (LUP's) came into effect that required maintenance of natural species diversity. LUP reforestation strategies include provisions for increased retention of advanced regeneration and deciduous stand components. Older plantations were established without this direction.
- Species composition of recently planted cutblocks won't necessarily be reflective of species composition at maturity, because of stand changes including natural regeneration and succession.

In view of these provisos, Figures 13 and 14 illustrate the results of a comparison of [tree species present on existing plantations]⁴ against [tree species representation in undisturbed forest in the BEC subzone]⁵, by BEC subzone. Species composition of the “undisturbed” forest in each BEC subzone has been grouped into different seral stages (i.e. mid, mature and old seral) to enable assessment of which species are naturally present, and which naturally fall out of the species mix as stands in that subzone mature. This in turn facilitates assessment of whether or not the species composition in plantations is reflective of the “natural” species composition.

2.9.3 Discussion:

CWHws2: spruce and pine dominate plantations, which is a logical trend because until the last few years all plantations have been planted to a spruce/pine mix (i.e. species that are commercially valuable as sawlog upon maturity) with an assumption that other species will establish naturally. However, pine is virtually absent from the “natural” forest, and spruce is present but at significantly lower levels. Conversely, hemlock is a major component of “natural” CWH forests but is noticeably absent in plantations.

This skew isn't viewed as a major concern, because feedback from field reviews by silviculturists is that a component of natural hemlock and balsam regeneration isn't

⁴ The species composition of plantations is the composition (by area) from the inventory label of all openings tracked by the Ministry of Forests' Integrated Silviculture Information System (ISIS).

⁵ The “undisturbed” forest species composition is the weighted average (by volume) of [species composition of mature forest greater than 20 years of age] and [species composition of 1993-2002 harvested volumes]. Harvested volumes have been weighted in because the “natural” species composition in the mature forest is potentially skewed by historical harvest. The years 1993-2002 have been selected as a representational period for historical harvest, in part because data are available for that period.

included in the inventory label because it doesn't meet countable height rules. These stems will comprise the understorey of maturing stands, and may eventually co-dominate.

ESSFmc: plantation composition trends slightly towards increased spruce and decreased balsam compared to the "natural" forest, else correlation is good. Pine is at a higher composition in early seral stages, but this is logical from an ecological viewpoint because pine is naturally succeeded by longer-living species over time.

ESSFmk: no ISIS results were available for comparison.

ESSFwv: same comments as for ESSFmc.

ICHmc1: plantation composition trends slightly towards increased spruce and decreased aspen and birch, else correlation is good. This trend is logical: removal of competing deciduous stems is a common silvicultural practice. The decreased aspen and birch composition is not a concern because (as Figure 13 shows) mid, mature and old seral species distributions indicate these species are naturally succeeded over time.

ICHmc2: same comments as for ICHmc1.

MHmm2: results indicate that plantations have a higher spruce component and a lower balsam component than the natural forest. These results are not of concern because at present there is minimal harvest in this BEC variant (ISIS records indicate only 30 hectares), and a reportable trend has yet to establish.

SBSdk:

- aspen trends from high composition at mid seral to no composition by old seral. Plantations have an aspen component, but at lower levels than may be natural in reference to mid seral composition levels. Because aspen is still present at significant levels (i.e. defined as >10% composition for this analysis), silviculturists do not view this development as a concern.
- cottonwood trends from very low composition at mid seral to relatively high composition by old seral (16%). Plantations have little or no cottonwood component at present, but this matches the seral trend.
- pine trends to be a higher component in plantations than in the natural forest. However, pine is still present to significant levels in the natural forest so this is not viewed as a major concern.
- results indicate that a component of hemlock is present in old seral (9%). Stands with high hemlock composition are generally absent from the SBSdk, so the location of these stands was investigated. It was determined that a minor component of hemlock is reasonable considering certain portions of the SBSdk are transitional to ICHmc1.

SBSmc2: plantation species compositions correlate well to seral trends.

Some thought has been put into the need for establishing tree species composition targets by BEC subzone. However, as this analysis illustrates, adherence to preferred and alternative species recommendations from past and present Establishment to Free Growing Guidelines has resulted in an early seral forest whose composition is, for the most part, strongly reflective of seral trends in the natural forest. The need for targets is not apparent.

2.9.4 Data sources:

Plantations – ISIS (DBCSIL80, current to December 2002).

Mature forest - TSR3 dataset (2000 update forest cover)

Harvested volumes – [1993-1999 openings from 1999 update MOF forest cover] PLUS [recently harvested cutblocks shown on licensee Forest Development Plans], overlain on MOF forest cover (with depletion update < 1993) to determine previous mature forest composition.

TBEC – the most recent version of Biogeoclimatic Ecosystem Classification mapping. A discrepancy in the location of the boundary between the ICHmc1 and the SBSdk was noted during analysis for this section of the State of the Forest report, and corrected in consultation with the Regional Ecologist.

Figure 13 -Species Composition by BEC Variant by Seral Stage

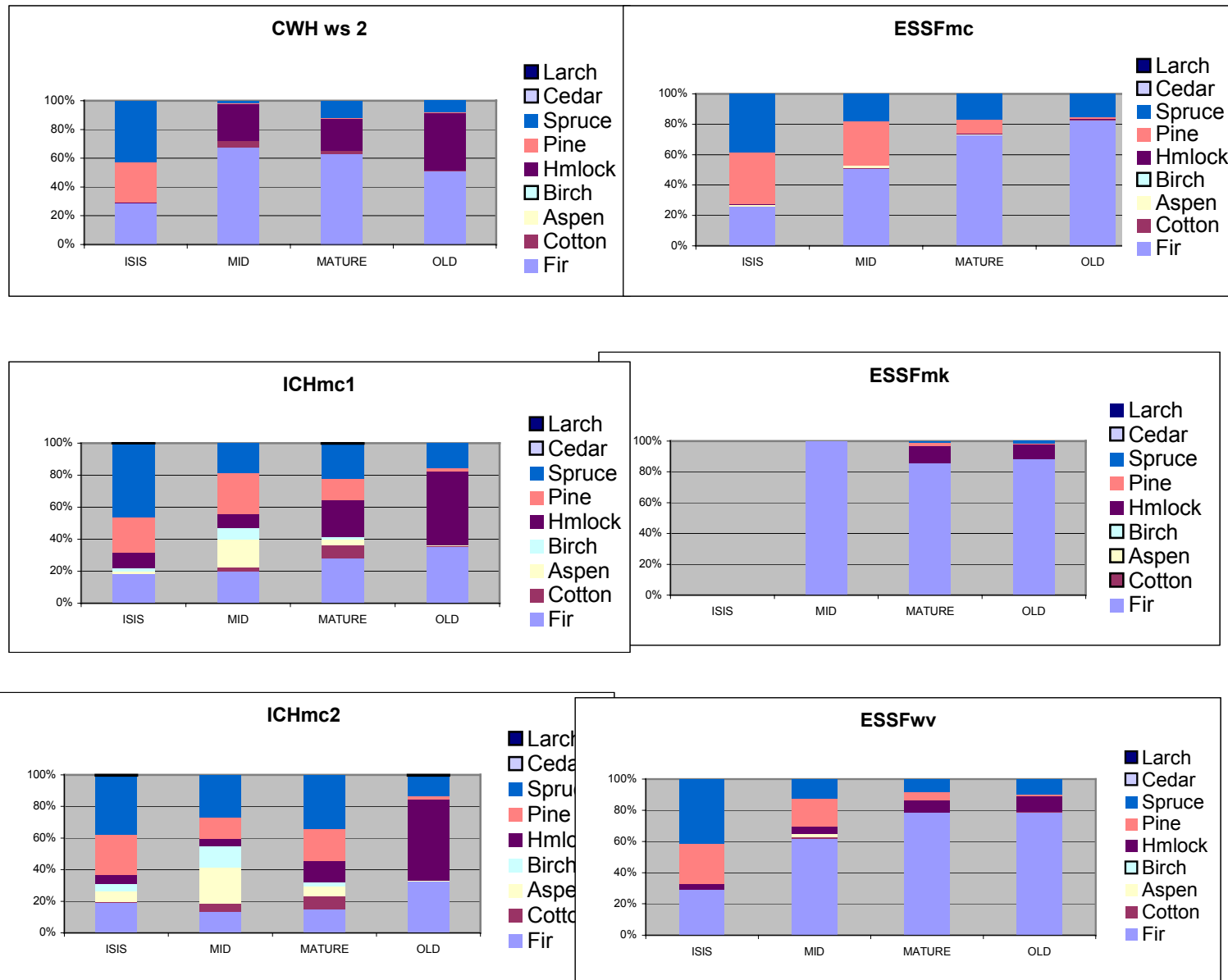
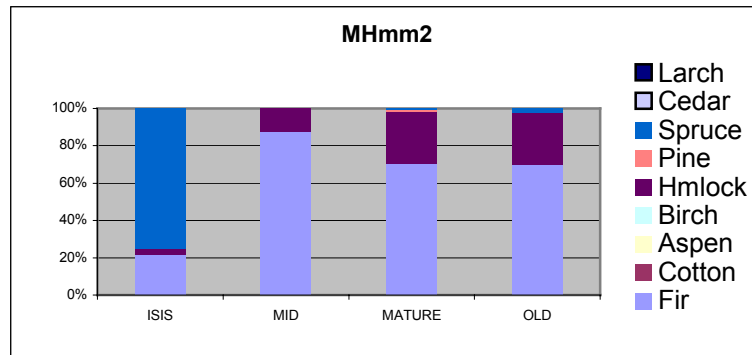
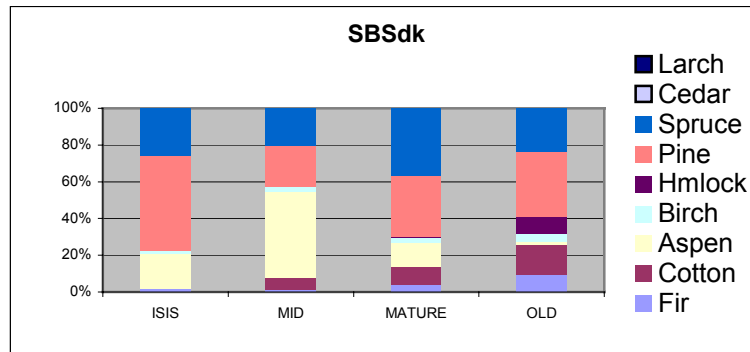
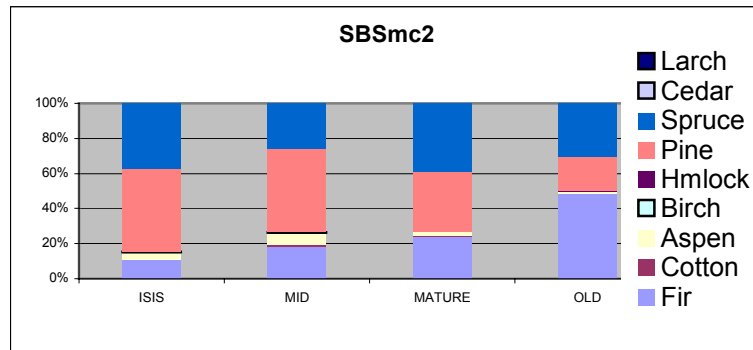


Figure 14 – Species Composition by BEC Variant by Seral Stage



3.0 Wildlife Habitat

3.1 Introduction:

LRMP general management direction for wildlife habitat is to maintain values in:

- critical wildlife habitats identified through the LRMP process, and
- any new wildlife habitat areas (i.e. identified since critical habitat mapping was completed).

The LRMP also directs “retention of habitat for endangered plant communities, plants, and animals”. Endangered animals that may be present in Bulkley TSA are listed in Table 6.

Table 6- Red or blue-listed animal species

Species	Red or blue listed
Giant pygmy whitefish	Red
Short-eared owl	Blue
American bittern	Blue
Swainson’s hawk	Blue (Red)
Trumpeter swan	Blue (Yellow)
Bald eagle	Blue
Bull trout	Blue
Wolverine	Blue
Fisher	Blue (Red)
Grizzly bear	Blue
Caribou (northern population)	Blue
Cutthroat trout, clarki ssp	Blue
Dolly varden	Blue
Peregrine falcon	Red

Sources: SRM’s “BC Species and Ecosystem Explorer” website: <http://srmapps.gov.bc.ca/apps/eswp/>;
Bulkley LRMP

In regards to managing critical wildlife habitats, the LRMP identified high-value wildlife habitat for five key wildlife species: caribou, goat, grizzly bear, moose and mule deer. Habitat mapping was refined by 1997, and forest management objectives were established for these refined areas in Bulkley’s Landscape Unit Plans.

Grizzly bear and caribou are thus accommodated by a fine-filter approach through managing mapped high-value habitat. Additional habitat is offered within the protective network, and within non-forested areas. The intent is that any gaps in habitat representation be accommodated by new Wildlife Habitat Area mapping and designation, especially for grizzly bear (Ann Hetherington, pers comm July 2003).

Habitat for endangered animals (with the exception of grizzly bear and caribou) is retained via a coarse-filter approach, within the protective network and mapped high-value habitat for the five wildlife species noted above.

3.2 Wildlife Indicator 1. Adherence to Forest Management Objectives for Five Key Wildlife Species

3.2.1 Measure:

Proportion of total harvested area within high-value habitat areas that meet forest management objectives for caribou, mountain goat, grizzly bear, moose and mule deer.

3.2.2 Results and Discussion:

LUP objectives for forest management within high-value wildlife habitats are as follows:

Caribou

- Provide for security cover, forage and large areas of inactivity over a rotation within the Telkwa Caribou Herd Recovery Program (TCHRP) area.
- Within a managed forest setting, provide for critical caribou habitat and forage by retaining Key Forested Caribou Habitat with mature and old forest characteristics.
- Within the ESSF Biogeoclimatic zone in the TCHRP area, emulate natural disturbance patterns by creating small openings with irregular edge configurations.
- Within the SBS Biogeoclimatic zone in the TCHRP area, emulate natural disturbance patterns by creating large aggregate blocks while providing for caribou forage and screening.
- Avoid caribou displacement, reduce human, caribou and predator interaction, and encourage caribou use of the TCHRP area.
- Limit access to protect caribou habitat (alpine and subalpine) surrounding Mooseskin Johnny Lake and its wetlands.
- The modelling parameters used to represent desired caribou habitat structure for timber supply review (TSR2) require a minimum 90% of the forested landbase within the habitat area, by landscape unit, to be greater than 50 years of age.

Mountain Goat

- Provide for thermal and snow interception cover and forage for wintering goat populations in areas near identified habitat (G).
- Provide for security for mountain goat from an unregulated harvest in important mountain goat habitat.
- TSR2 habitat structure modelling assumptions require that only a maximum 33% of the forested landbase within the habitat area, by landscape unit, can be less than 3 metres in height.

Grizzly bear - Babine

- Avoid human-bear conflicts and maintain high value grizzly bear habitat (GB)
- Maintain the diverse understory within high value, mixed-forest habitat (GBA)
- Limit road development and the number and duration of entries within moderate value grizzly bear habitat

- TSR2 habitat structure modelling assumptions (applied to forested landbase within the habitat area, by landscape unit)
 - high value (and grizzly habitat: minimum 80% > 50 years)
 - high value mixed habitat: maximum 25% < 3 metres
 - moderate value habitat: no special constraint

Grizzly bear – Management Unit 1: Boucher Creek Wetlands

- Allow for the movement of grizzly bears between the Van Fire, Bait Range and Babine River in the Boucher Creek Wetlands management unit

Grizzly bear – Management Unit 2: Nichyeskwa South; Management Unit 3:

Nichyeskwa North

- Allow for the movement of grizzly bears between feeding areas and reduce the potential of human-bear contact in the Nichyeskwa North and South management units.

Moose

- Ensure forage is retained and available in identified moose winter range
- Provide for security, visual, thermal and snow interception cover within identified moose winter range
- TSR2 habitat structure modelling assumptions require that only a maximum 33% of the forested landbase within the habitat area, by landscape unit, can be less than 3 metres in height.

Mule deer

Habitat is primarily concentrated in the Bulkley Valley, which as yet has no established LUP objectives.

- TSR2 habitat modelling parameters require that only a maximum 20% of the forested landbase within the habitat area, by landscape unit, can be less than 20 years of age.

Table 7 reports on areas that have been harvested to date within high-value wildlife habitat areas, and Figure 15 shows their location. Table 7 and Figure 15 are separated into ranges of years to allow focus on what has been harvested before and since LUP objective (1998) establishment. Figure 16 provides some pictures of post-1998 harvest in high-value habitat types, for a visual perspective.

A column has been added to report what proportion of high-value habitat areas harvested since 1998 meets LUP objectives. The value is 100% in all cases because from 1998 to 2002, all submitted licensee silviculture prescriptions were reviewed against LUP objectives and strategies, and were rejected for revision if found in non-compliance⁶. With the exception of moose habitat, the table reveals that harvest as a proportion of total habitat type is still at fairly low levels.

⁶ The proportion of area harvested prior to 1998 that meets LUP objectives has not been provided because the information is unavailable.

Table 7 – Area of Harvest in High-Value Wildlife Habitats

High-Value Wildlife Habitats	Area Harvested before 1998 (ha)	Area Harvested 1998-2002 (ha)	Total Harvest (ha)	Total Area in Habitat Type (ha)	Total Harvest as % of Type	1998-2002 Harvest Meeting LUP Obj's (%)
Caribou	44	34	78	6,468	1	100
Mountain Goat	130	83	213	140,683	0.2	100
<i>Grizzly Bear High Value</i>	495	191	687	14,468	5	100
Grizzly Bear High-Value Mixed	146	5	151	2,532	6	100
Moose	11,515	224	11,739	88,345	13	100
Mule deer	57	1	58	1,416	4	100
Moose/ Mule Deer	1,142	62	1,204	20,837	6	100
Totals:	13,208	600	14,130	274,749	-	-

Establishment of formal habitat structural targets for high-value habitat types is being contemplated, but a formal process has yet to be conducted. In the absence of formal targets, Table 8 provides an informal comparison of current height and/or age structure within high-value habitat areas at the landscape level against parameters modelled for the most recent timber supply review, to focus on areas where problems may be developing.

Table 8 – Current Stand Structure versus TSR Modelling Parameters

LU	Caribou (parameters: min 90% > 50 yrs)	Mountain Goat (parameters: max 33% <3 m)	Grizzly Bear High (parameters: min 80% >50 yrs)	Grizzly Bear High Mixed (parameters: max 25% <3 m)	Moose (parameters: max 33% <3 m)	Mule deer (parameters: max 20% <20 yrs)
Babine		Y	Y	Y		
Blunt		Y			N (>20%)	
Bulkley	Y	Y			Y	Y
Chapman		Y			Y	
Copper		Y			Y	
Corya		Y	Y		Y	Y
Deep Creek					Y	Y
Harold Price		Y	N (<5%)		Y	
Kitsequecla		Y			Y	
Nilkitkwa		Y	Y			
Reiseter		Y			Y	Y
Telkwa	Y	Y			Y	Y
Torkelson		Y	Y		Y	
Trout Creek		Y			Y	Y

Y = habitat structure currently achieves parameters; N = does not achieve parameters;
(<n%) = how close current structure is to target structure

The table shows that TSR height and/or age structure parameters are achieved in wildlife habitat areas, with the exception of moose habitat in the Blunt and High Value grizzly bear habitat in the Harold Price. In the absence of formal habitat structure targets, a definitive recommendation for areas where parameters are not achieved cannot be provided. However, it is logical that any new harvest proposals submitted for these areas are rationalized with these results in mind.

3.2.3 Data Sources:

- Bulkley LRMP
- Bulkley LUP's
- 1999 update FC1 forest cover (Northwest Data Centre, Bulkley District dataset)
- Licensee Forest Development Plan digital map submissions (to acquire boundaries of blocks harvested from mid-1999 to the end of 2002)
- LRMP/LUP wildlife habitat maps

Figure 15

Harvest in High-Value Wildlife Habitat

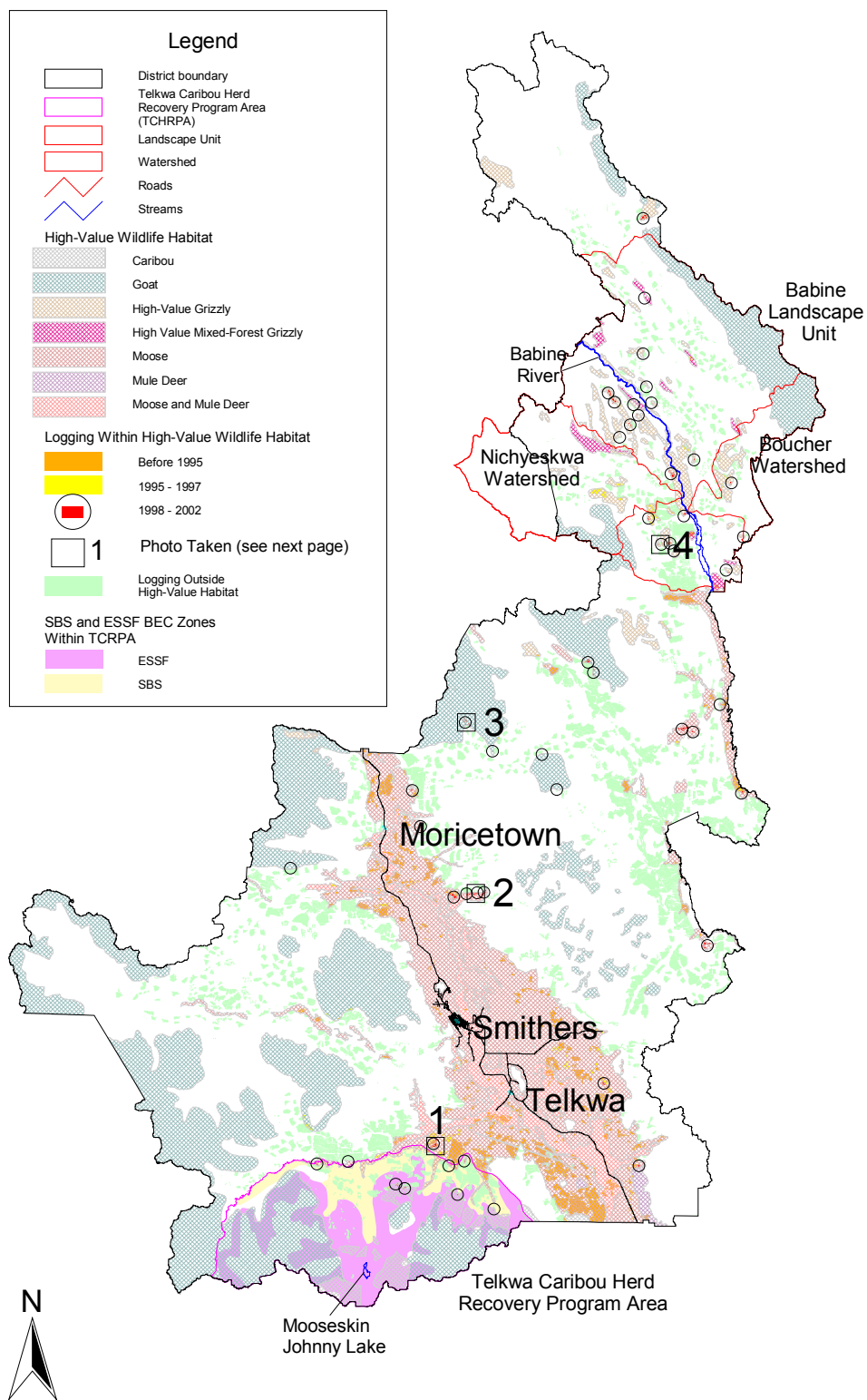
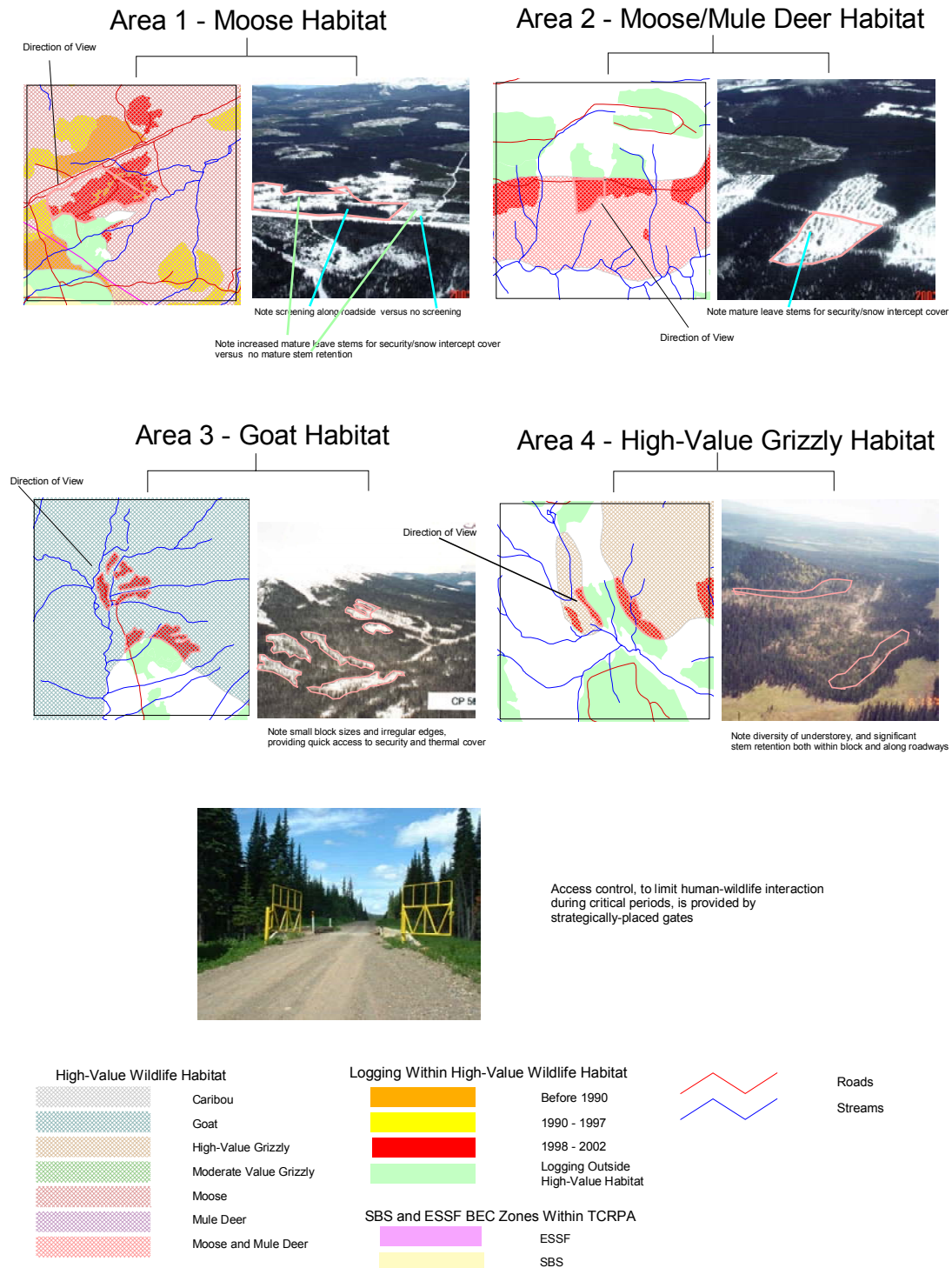


Figure 16

Examples of Harvest in High-Value Habitat



4.0 Watershed Integrity

4.1 Introduction:

General management direction from the Bulkley LRMP indicates that water “health” is thought to be maintained if fish habitat, and the production of clean potable water in community watersheds, is maintained.

The topic of “maintaining fish habitat” is complex: it has several integrated elements including inventorying, monitoring changes, and taking action to remedy perceived imbalances in:

- fish population sizes (i.e. populations by individual species, by water system utilized by that population).
- riparian habitats (i.e. instream and upslope areas associated with waterbodies), which support fish populations
- water quality, i.e.
 - temperature
 - turbidity; total suspended sediment
 - water chemistry (e.g. pH; dissolved oxygen content; phosphorus levels)
 - ability to support aquatic invertebrate life
- water quantity

The topic of “maintaining the production of clean potable water in Community Watersheds” breaks out into:

- maintaining a level of water cleanliness suitable for human consumption; i.e.
 - low coliform levels
 - low levels of total suspended solids
 - “good” water chemistry (e.g. neutral pH levels, low phosphorus content)
- “maintaining production”; i.e. ensuring continued stream flow to water users in the Community Watershed.

There is a close parallel with water quality and quantity elements of “maintaining fish habitat”, albeit viewed from a human consumer perspective, so the topics will be discussed simultaneously in the indicator writeups.

Several government agencies manage the various elements of water quality, in a co-operative (although not fully co-ordinated) manner. A matrix of responsibilities is shared between the Ministry of Health, the Ministry of Sustainable Resource Management (SRM), the Ministry of Water, Land and Air Protection (WLAP), the Federal Department of Fisheries and Oceans (DFO), and the Ministry of Forests (MOF).

- the Ministry of Health assumes ultimate responsibility for providing safe drinking water for British Columbians, under the Drinking Water Protection Act.
- SRM is responsible for making appropriate land use decisions that carefully consider water protection.

- WLAP is responsible for protection of water quality (including water potability), stewardship of biodiversity including fish habitat, and environmental monitoring and enforcement.
- DFO is responsible for stewardship of fisheries and fish streams.
- MOF is responsible (under the Ministry of Forest Act) for stewardship of Crown forest and range resources. This includes co-ordination and integration with other agencies for managing fish and water resource values. Practically, a division of responsibility is maintained between instream (DFO, Ministry of Health, and WLAP) and upslope (MOF) processes.

This section focuses on the MOF's sphere of responsibility, which revolves around maintaining watershed integrity. As summarized from Wilford (2001), "watershed integrity" is maintained if development does not result in a significant increase over natural characteristics/levels of:

- Peak stream flow
- Landslide activity
- Surface erosion
- Stream channel bank erosion; channel bed characteristics
- Stream channel location

Watershed Integrity Indicators

- 1) Terrain Stability Mapping/ Sediment Transport Capability Mapping (object: to identify potential problem areas for sediment delivery into waterbodies, prior to new development)
- 2) Overview watershed assessment procedures and reassessments (object: to monitor/assess watershed integrity on an ongoing basis).
- 3) Watershed restoration (object: to rehabilitate areas where watershed integrity is at risk as a result of past and current development)
- 4) Co-ordinated water quality monitoring (object: to monitor water quality in sensitive watersheds over time, as an aid in assessing whether or not integrity problems are developing)

4.2 Watershed Integrity Indicator 1. Terrain Stability/Sediment Transport Capability Mapping

4.2.1 Background:

Weiland and Maloney (1997) state that the following terrain types have moderate to high potential to deliver sediment into associated waterbodies, especially if disturbed by harvest or road building:

- Loamy, sandy or silty soils with gentle slopes (<15%) and a high watertable
- Long uniform slopes (>15%) with loamy soils and moderate [or poorer] drainage
- Steep gulleys and steep streamside scarp slopes of a variety of materials, including glacial till over bedrock.

These terrain types are mapped as moderate to very high surface erosion potential (through sediment transfer potential mapping), and/or as unstable or potentially unstable terrain (through terrain stability mapping).

Forest development within these terrain types has the potential to affect natural or characteristic levels of each of the watershed integrity elements listed in the Introduction. Completion of this mapping across the TSA is thus an obvious step in identifying potential high hazard sediment sources prior to planned forest development within those areas.

4.2.2 Measure:

Progress towards full completion of Terrain Stability, and Sediment Transport Capability mapping for Bulkley TSA

4.2.3 Results and Discussion:

Figure 17 shows current progress towards completion of reconnaissance-level terrain stability and sediment transfer potential mapping⁷. The figure shows that a significant proportion of the District has been mapped: 47% of total area and 61% of area in the current Timber Harvesting Landbase.

If [forested areas with slopes greater than 60%] is used as a proxy measure to represent high hazard sediment sources, then approximately 92% of sources have either been mapped or are contained within no-harvest areas (i.e. parks, ecoreserves, LRMP SMZ1 zones, and Core Ecosystem areas).

⁷Section 12 of the Operational Planning Regulation requires completion of terrain stability hazard/soil erosion potential mapping prior to approval of harvesting/road building activities in community watersheds

Section 17 requires completion of terrain stability field assessment for areas with a high likelihood of landslides, unstable terrain, or a slope gradient greater than 60%, prior to approval of a Cutting Permit outside community watersheds. This presumes a need for reconnaissance-level terrain stability mapping and/or slope mapping, to identify areas at risk.

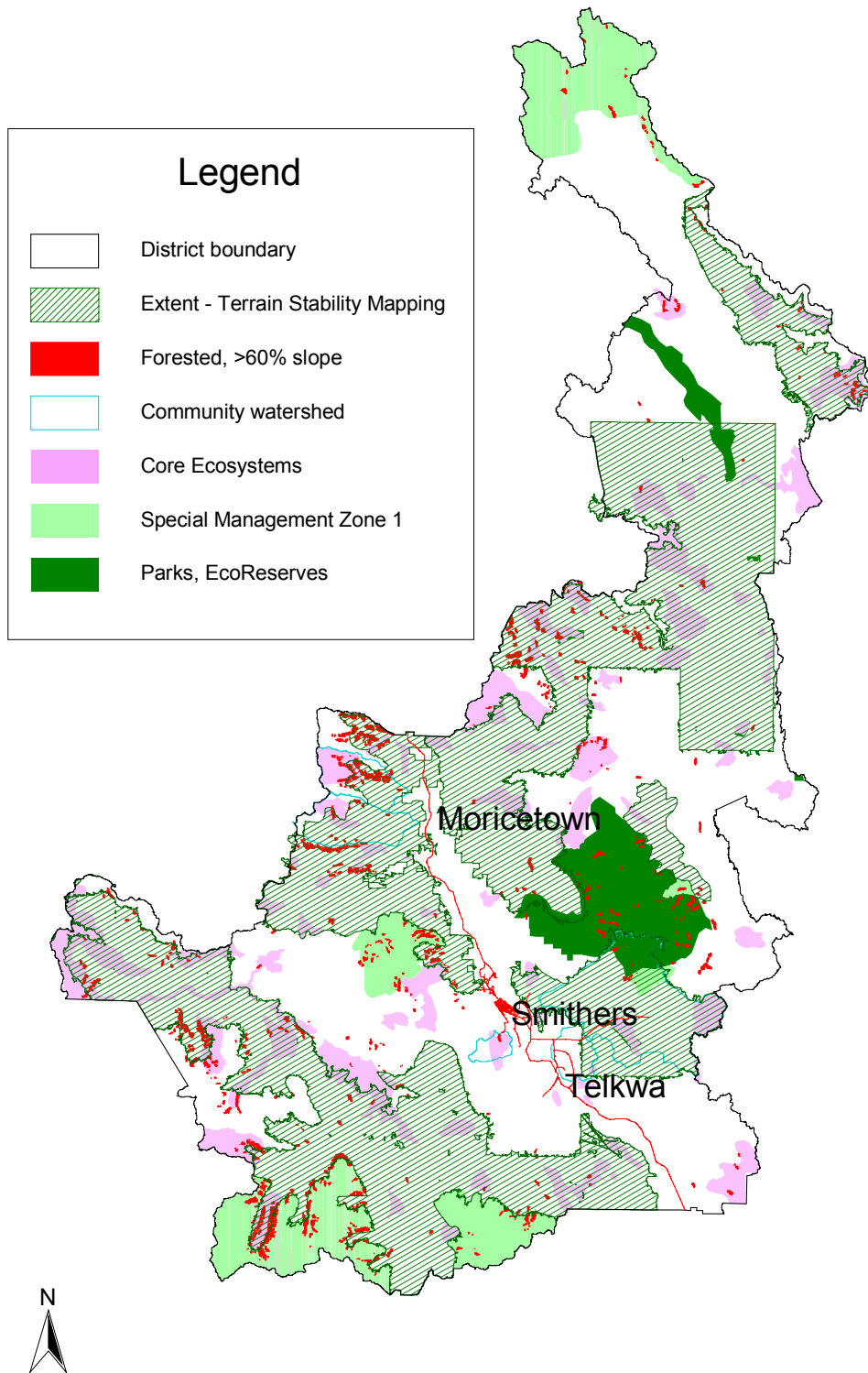
4.2.4 Data Sources:

Wilford, D. 2001. Hydrologic Integrity of Watersheds. Unpublished Ministry of Forests Report.

Weiland, I. and D. Maloney. 1997. Review of Surface Erosion Potential Ratings, Nilkitkwa Area, Bulkley TSA. Unpublished Ministry of Forests Report.

Figure 17

Extent of Reconnaissance-Level Terrain Stability Mapping



4.3 Watershed Integrity Indicator 2. Overview Watershed Assessments and Reassessments

4.3.1 Background:

Section 14 of the Operational Planning Regulation of the Forest Practices Code of BC Act requires a watershed assessment to be completed for:

- (a) community watersheds,
- (b) watersheds with significant downstream fisheries values, licenced domestic water users or significant sensitivity, and
- (c) other watersheds for which the district manager determines an assessment is necessary.

In 1999, an expert panel comprised of Ministry of Forests, federal Department of Fisheries and Oceans, and BC Environment (now Water, Land and Air Protection) staff reviewed all Bulkley watersheds and identified those meeting the above criteria. From this reduced list, the need for a watershed assessment procedure (WAP) was determined based on their subjective analysis of:

- Implications of previous development to watershed integrity,
- Significant fisheries values,
- Presence of hydrologic features (e.g. lakes, wetlands, mountains), that buffer or limit buffering of runoff,
- Terrestrial sediment input hazard, based on expert knowledge and available terrain stability/sediment transport capability mapping,
- Other key attributes, e.g.
 - significant agricultural development,
 - presence of a population of endangered species (e.g. bull trout),
 - fish production capability,
 - current protection through LRMP zonation.

The panel determined that an overview WAP should be conducted in a watershed if development exceeded a set proportion of the operable landbase less than 25 years (i.e. an assessment “trigger”). The “trigger” was set to a conservative 10 or 15%, depending on assessed sensitivity. The MOF district manager and the MELP regional manager provided panel recommendations to forest licensees in February 2000. Forest licensees are in various stages of completing overview WAP’s for identified watersheds or watershed groups in their areas of responsibility.

The intent of overview WAP’s is to ensure that past and future development doesn’t result in loss of watershed integrity. Overview WAP’s completed to date have recommended rehabilitation measures, or (more commonly) have established more realistic triggers for future assessment based on:

- equivalent clearcut area (ECA), which is a measure of amount of harvest and progress towards hydrologic greenup,
- watershed “peak flow” index,
- road density (km of road per km² of total watershed area), and
- stream crossing density (number of crossings per km² of watershed area).

Recommended rehabilitation measures have included:

- Road and stream crossing deactivation
- Upslope restoration works
- Cessation of harvest until ECA reduces naturally through stand maturation.

4.3.2 Measure:

Progress towards completion of overview watershed assessment procedures for Community and identified sensitive watersheds, and towards completion of watersheds requiring reassessment.

4.3.3 Results and Discussion:

Current status of overview WAP's is illustrated on Figure 18. In summary, licensees have completed 80% of required overview WAP's (i.e. for watersheds having levels of development that exceed assessment triggers). Focus is placed on those watersheds exceeding WAP triggers but with no overview WAP completed - Table 9 summarizes the rationale for this lack. It should be noted that Bridge watershed is just below its assessment trigger – however, no new development is planned so completion of an overview WAP is not yet required.

Table 9 – Watershed Groups Requiring but Lacking Overview WAP

Watershed group	Responsibility	Key Value	Reason overview WAP is not completed
Corya	SBFEP	Community Watershed	No plans for new development. WAP must be completed if new development is proposed.
John Brown	SBFEP	Community Watershed	See Corya
Toboggan	SBFEP/PIR	Important fish habitat	See Corya
Fulton	SCI	Important fish habitat	Present financial difficulties of SCI. WAP must be completed before any new development is proposed.

Overview assessment recommendations (and progress towards completion of recommendations) and new reassessment triggers (where set) are available on request.

Watershed status with respect to reassessment triggers is illustrated in Figure 19. Table 10 summarizes licensee actions in watersheds that have exceeded reassessment triggers.

Table 10 – Licensee Action in Watershed Groups that Exceed Reassessment Triggers

Watershed group	Responsibility	Action
Boucher	PIR/ SCI	No additional harvest proposed in 2002-2011 Forest Development Plan
Nilkitkwa Lake	PIR/ SCI	Will hold off submitting future cutting permit applications until another watershed assessment is done
IR No. 5 Nilkitkwa	PIR	No additional harvest proposed in 2002-2011 Forest Development Plan

Heal	PIR	Current stream crossing density exceeds trigger. Proposed harvest will result in ECA trigger being exceeded. Will conduct a field-level channel survey/stream crossing assessment after completion of proposed harvest and abide by recommendations
Five Mile	PIR	No additional harvest proposed in 2002-2011 Forest Development Plan

Figure 18

Status of Watershed Assessment Procedures

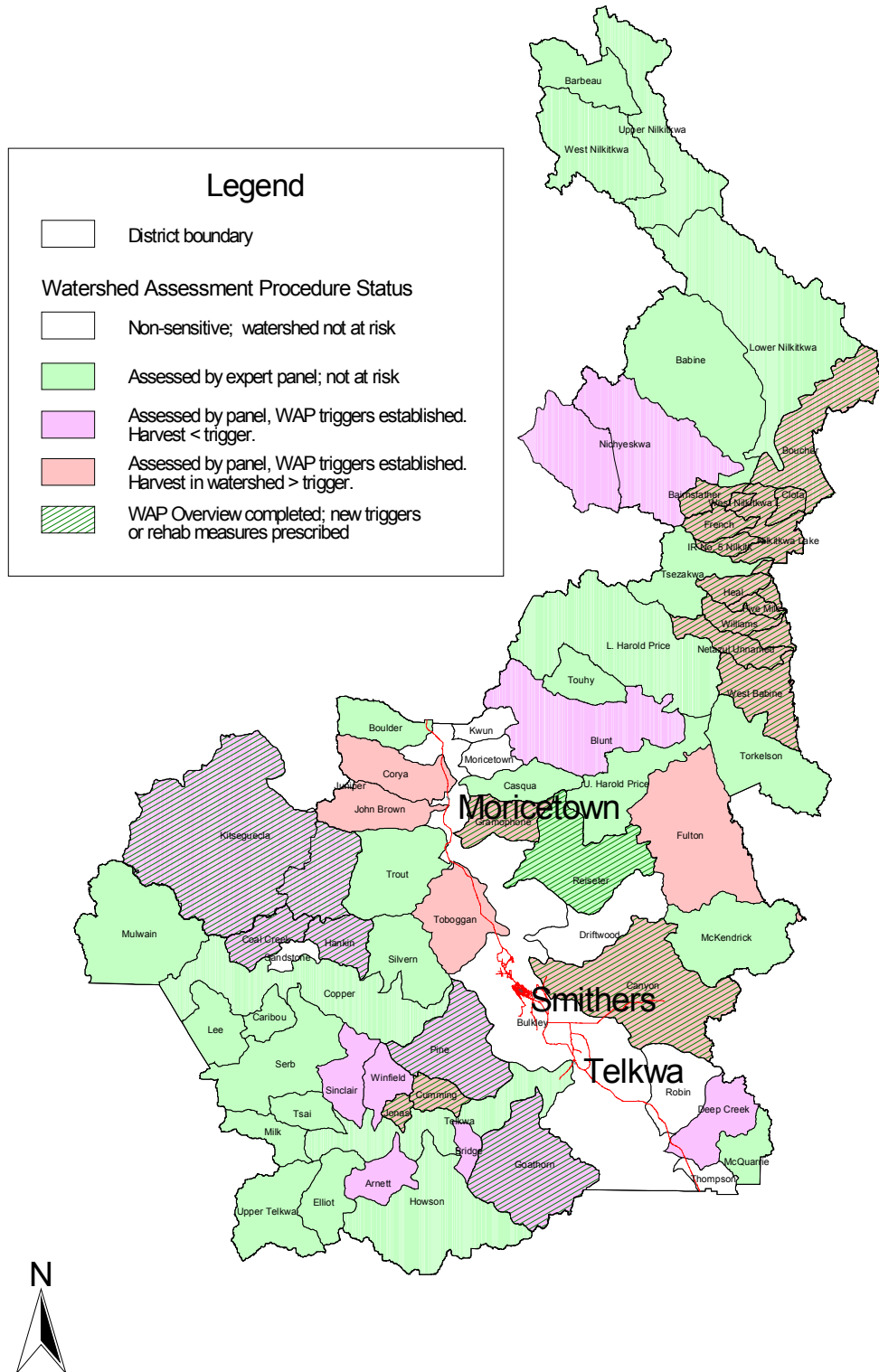
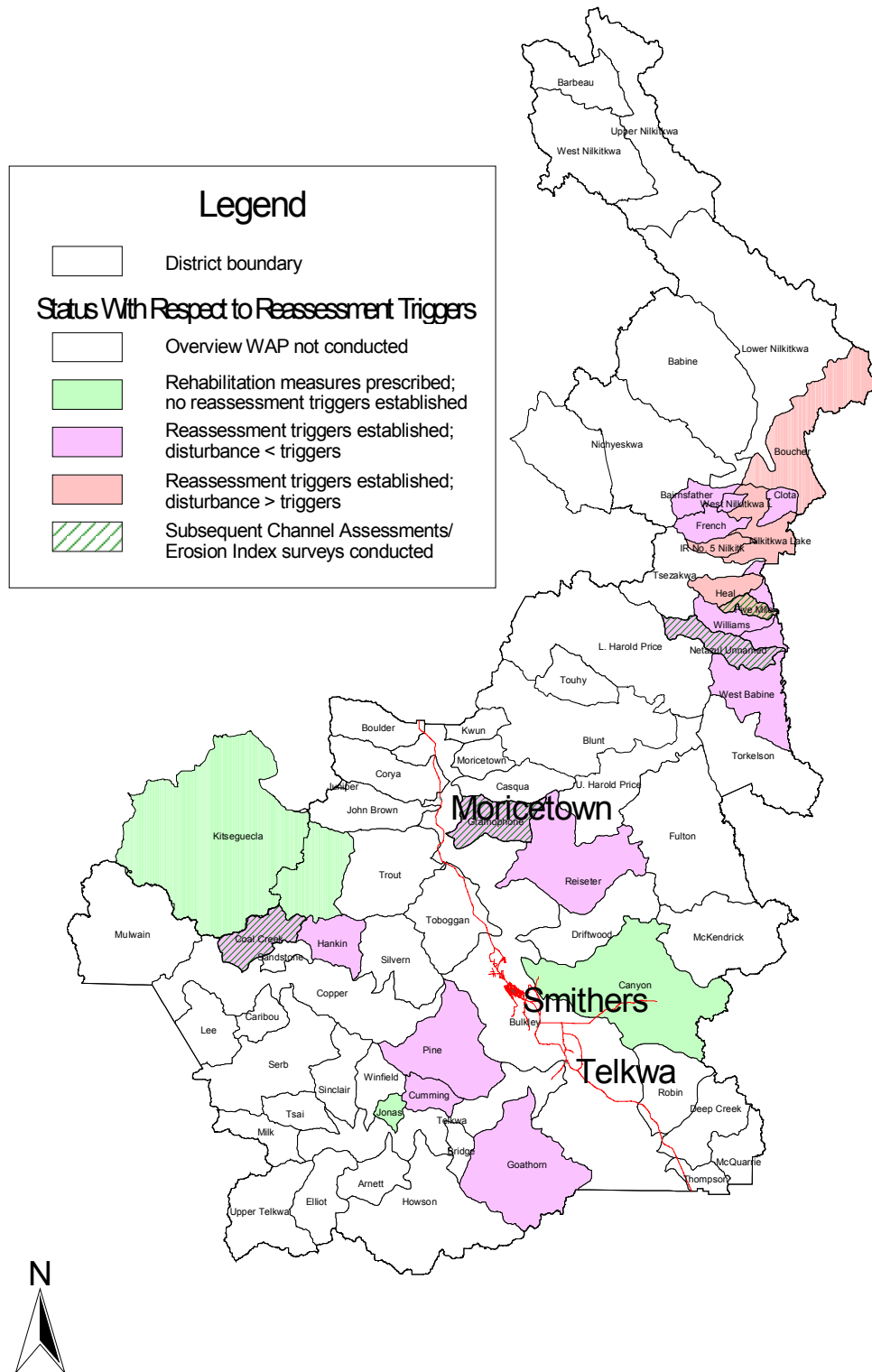


Figure 19

Status of Watersheds per Reassessment Triggers



4.4 Watershed Integrity Indicator 3. Watershed Restoration

4.4.1 Background:

The MOF regulates licensee harvest, road building and range activities with the intent of preventing environmental damage to natural resources including fish habitat. The MOF's Compliance and Enforcement section ensures adherence to these standards, and compliance statistics since Forest Practices Code establishment are exemplary in Bulkley TSA. However, there is a legacy of pre-Code activity that was not to the same standard, and the integrity of sensitive watersheds can be compromised by future development. Hence the rationale for "watershed restoration".

The intent of the Forest Renewal BC (FRBC)-funded Watershed Restoration Program (known more recently as the "Enhancing Environmental Values" program) was to restore and protect fish habitat and domestic water supply in priority watersheds through upslope, in-stream or riparian work activities. It was also intended for completed watersheds to be monitored on an ongoing basis to assess treatment efficacy. The EEV program ended in 2001 when FRBC was discontinued and monitoring is incomplete, although it may continue in future under alternative funding sources.

Priority watersheds for restoration were selected based on a combination of factors:

- Presence of fish populations of provincial or regional significance, or at high risk of extinction.
- Value for domestic water use (i.e. Community Watersheds, or watersheds with licensed water users).
- The probability that negative effects on aquatic habitat will occur from past and future harvesting.
- The probability that works will successfully remedy problems with aquatic habitat.
- The extent of previous restoration investment

Because FRBC funding was finite, only Bulkley's "key priority" watersheds received funding for WRP works in latter years of the program. "Key priority" watersheds are within the top 20% of most highly sensitive watersheds in the WLAP Skeena Region based on the factors listed, as assessed by a regional stakeholder panel comprised of government agency and licensee representatives. In latter years, funding was also directed at a District-wide assessment of culverts at fish stream crossings, and replacement of those impassable to fish.

4.4.2 Measure:

Progress towards completion of restoration activities in key priority watersheds

4.4.3 Results and Discussion:

Figure 20 shows progress towards completion of watershed restoration activities in key priority and other watersheds. The progression of activities towards full completion includes:

- Completion of Level 1 Interior Watershed Assessment Procedures (IWAPs). IWAPs describe the basic geophysical characteristics of the watershed and the extent and

location of harvesting activities in the watershed. It derives values for the following indicators of watershed integrity

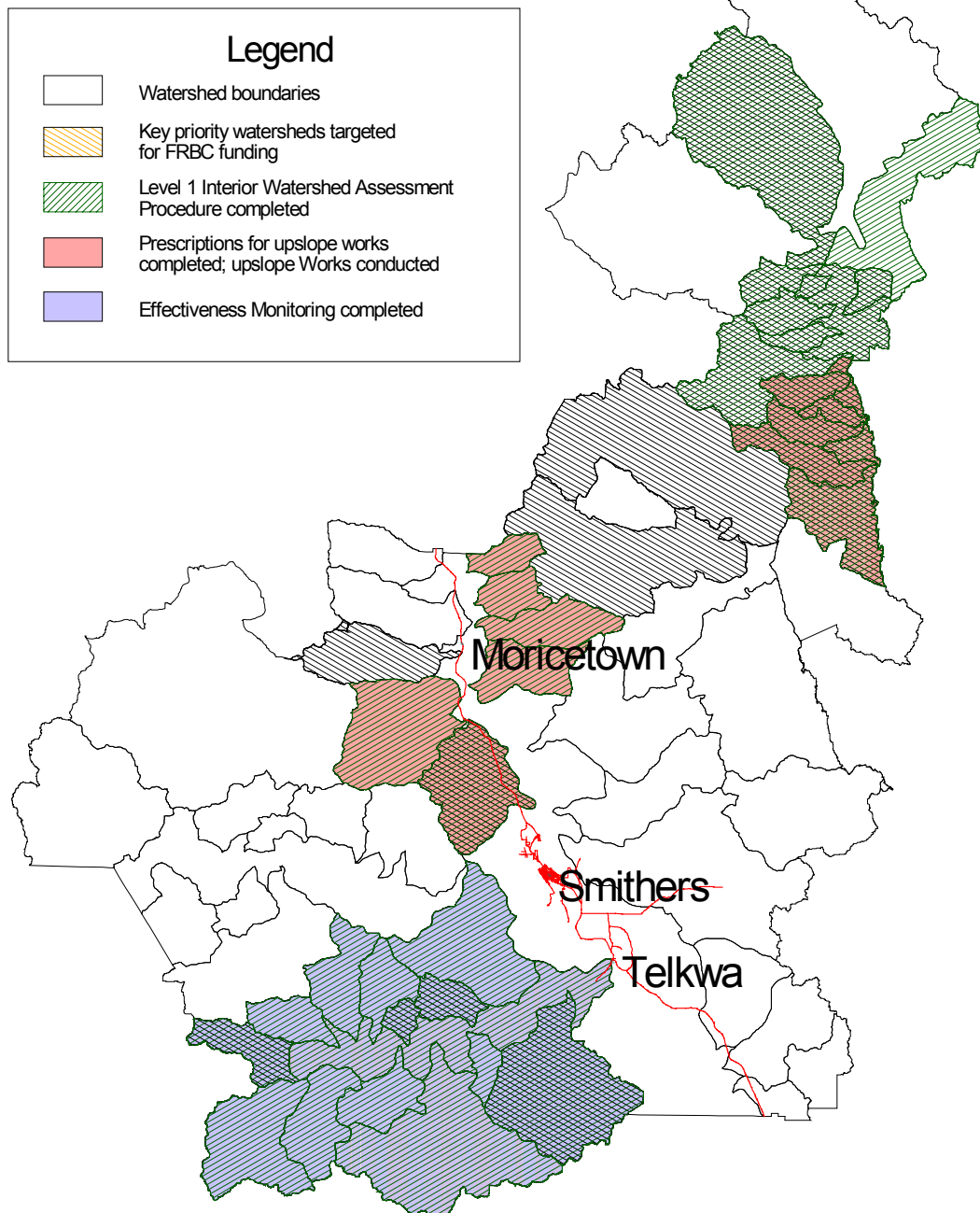
- Peak flow index
 - Road density (in upper 60% of watershed; on erodible soils; on unstable or potentially unstable terrain less than 100 m from a stream)
 - Stream crossing density
 - Portion of streams (fish bearing and non-fishbearing) that have been logged to the streambank
- Preparation of prescriptions for conducting restoration works
 - Completion of works
 - Effectiveness monitoring

There is an overlap of information provided by the Level 1 IWAP and Overview Watershed Assessments. However, the two types of assessments are not interchangeable because Level 1 IWAPs predate most overview watershed assessments and provide detail to assist in directing specific watershed restoration projects.

In summary, Figure 20 indicates that Level 1 IWAP's were completed for 20 of the 23 watersheds identified as "key priority". Subsequent prescriptions and upslope works were completed for 13 of the 20 key priority watersheds with completed IWAP's. Subsequent effectiveness monitoring is complete for 4 key priority watersheds. The figure also indicates which other "non-key priority" watersheds have had restoration activity.

Figure 20

Status of Watershed Restoration Activities



4.5 Watershed Integrity Indicator 4. Co-ordinated Water Quality Monitoring

4.5.1 Background:

The most obvious indication that watershed integrity may be at risk is significant changes (i.e. beyond natural levels) in the physical and chemical characteristics of water flowing from that watershed.

Historically, agencies and forest licensees have undertaken short and long-term water quality monitoring projects in an ad hoc fashion. In 2003, a Bulkley Aquatic Resource Committee (BARC), comprised of forest licensee and government agency representatives, was formed and tasked with a continuous and strategically focused water quality monitoring effort. Focused monitoring should enable identification of watershed integrity problems as they occur, and the committee structure will facilitate discussion and immediate response to issues. This structure also enables pooling of limited funding.

A draft strategy document has been prepared (BARS). It includes the following elements that will facilitate data gathering for the suggested future measure:

- watershed-level monitoring of water quality attributes for “sensitive” streams (e.g. temperature or sediment-sensitive spawning streams; streams with domestic use water licenses; areas of moderate or higher soil erosion potential, etc.).
- site-level monitoring, to assess short term impact of road building, harvest or other human-caused disturbances.

The draft strategy also includes other water quality indicators/measures, that may be reported on in future versions of the State of the Forest Report depending on the success of BARC strategy implementation:

- variations of Stream Crossing Quality Index (SCQI),
- percent fish passage on identified culverts,
- a modified indicator of Watershed Health (involving Equivalent Clearcut Area, Road Density and Number of Stream Crossings),
- compliance and enforcement statistics, and
- number of current studies.

In the interim, this section summarizes information on the location and status of past water quality monitoring efforts.

4.5.2 Interim Measure:

Status of historical water quality monitoring efforts in Bulkley TSA

4.5.3 Future Measure:

Comparison of water quality and/or quantity attributes against the natural range of variability for these attributes, for selected streams in sensitive watersheds.

4.5.4 Results and Discussion:

Monitoring of various water quality attributes has been undertaken for many years in Bulkley TSA by agencies and forest licensees. Table 11 summarizes features of their monitoring programs. Figure 21 shows the location of past and current monitoring/study sites⁸.

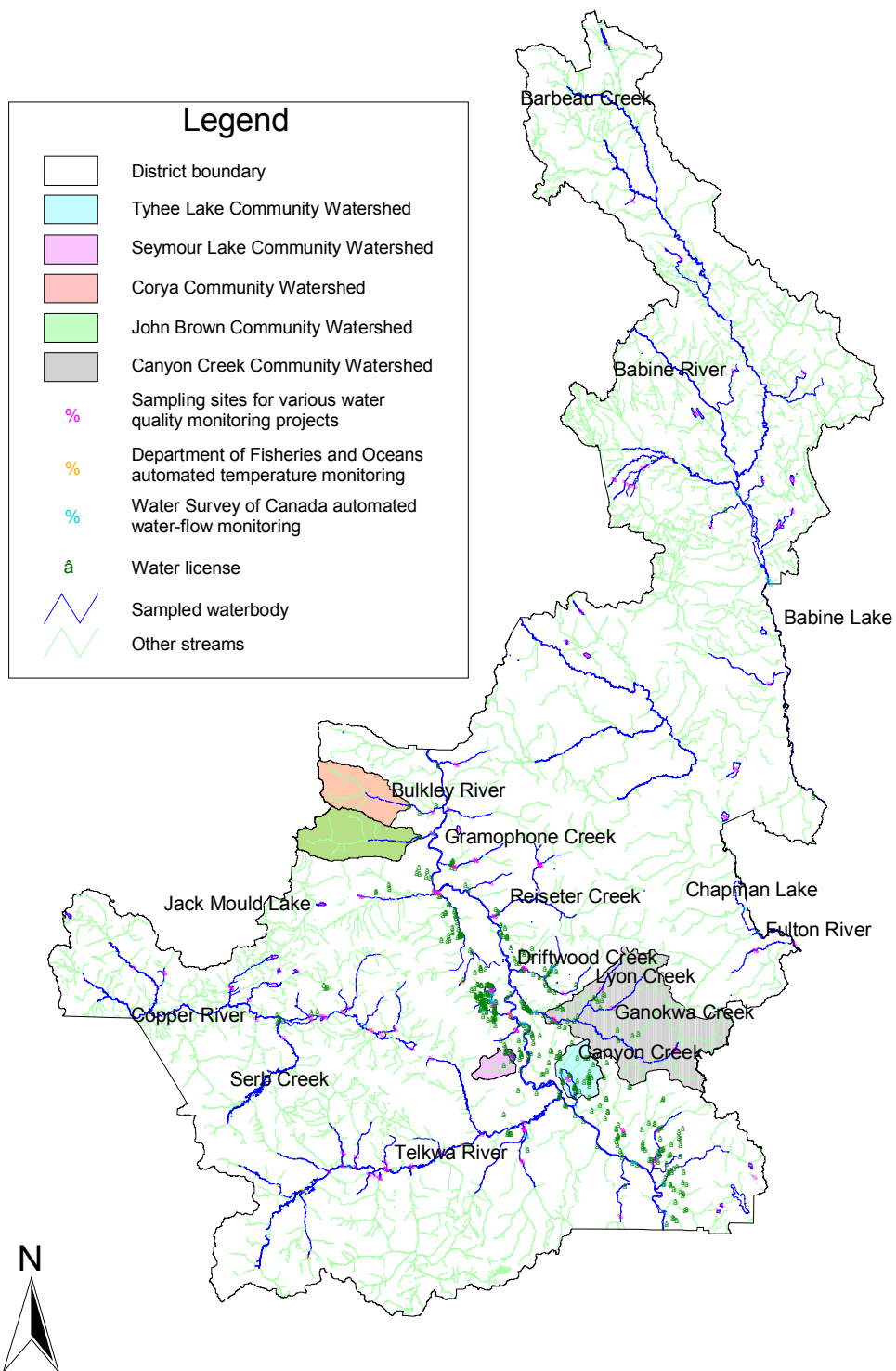
Table 11 – Water Quality Monitoring Program Features by Agency

Agency	Waterbody type	Monitored or Assessed Characteristic	Ad hoc or Continuous Basis	Objective
DFO	Major streams, rivers	Water temperature, Water chemistry	Both	Capability of supporting anadromous fish populations
Water Surveys of Canada	Major streams, rivers	Flow levels/depth	Continuous (for limited periods)	Peak flow
WLAP (formerly MELP), MSRM	Lakes, streams, rivers, wetlands	Suspended solids/turbidity, Coliform content, Benthic invertebrates, Water chemistry Sediment accumulation Water temperature	Both	Water quality against set quality objectives; development/ testing of “toolbox” of monitoring techniques
MOF, Forest licensees	Streams	Suspended solids/Turbidity Temperature Water chemistry (pH)	Ad hoc	Directly assessing impact of harvest or road related disturbance

⁸ Relational database is available on request

Figure 21

Water Quality Study Locations



The Bulkley LRMP identifies specific water bodies where water quality is considered to be of special concern. Those waterbodies not already protected within parks, LRMP SMZ1 zones or Core Ecosystems are listed in Table 12, along with a summary of values, past monitoring activities, and an assessment of whether LRMP value is addressed.

Table 12 – Status of Water Quality Monitoring for LRMP Identified Sensitive Areas

Waterbody	LRMP Value	Water Quality Monitoring Activity	Addresses Need
Babine River and tributaries	Water quality, clarity, and hydrologic stability	<ul style="list-style-type: none"> Main stem and tribs sampled for temp, pH from 1995-1997 (Triton) Several locations (e.g. 1951-present at fish weir) autosampled for temp (DFO) Long history of flow level autosampling (Water Survey of Canada) 	Partly ⁹
Babine Lake	Water quality	<ul style="list-style-type: none"> Autosampled for depth 1972-1977 (Water Survey of Canada) 	No
Reiseter Creek, and tributaries with water licenses	Domestic water supply/quality	<ul style="list-style-type: none"> IBI sampling from 2000-2002 (WLAP) Main stems and tribs sampled for temp, pH from 1995-1997 (Triton) 	Partly ²
Driftwood Creek and tribs	Domestic water supply/quality	<ul style="list-style-type: none"> IBI sampling from 2000-2002 (WLAP) Sampled for temp, pH from 1995-1997 (Triton) 	Partly ²
Lyon Creek and tribs	Domestic water supply/quality	<ul style="list-style-type: none"> IBI sampling from 2000-2002 (WLAP) Sampled for temp, pH from 1995-1997 (Triton) 	Partly ²
Ganokwa Creek and tribs	Domestic water supply/quality	<ul style="list-style-type: none"> IBI sampling from 2000-2002 (WLAP) Sampled for temp, pH from 1995-1997 (Triton) 	Partly ²
Canyon Creek and tribs	Domestic water supply/quality; Community Watershed	<ul style="list-style-type: none"> Autosampled for flow levels 1973-1998 (Water Survey of Canada) Sampled for temp, pH from 1995-1997 (Triton) IBI sampling in 1997, 2000-2001 (WLAP) Streambed sediment / suspended sediment assessment and chemical analysis in 1997 	Partly ²

⁹ Past work may aid in establishing baseline water quality attribute measures. However, LRMP language presumes a continuous monitoring effort.

Gramophone Creek	Water licenses	<ul style="list-style-type: none"> ▪ Sampled for temp, pH from 1995-1997 (Triton) ▪ IBI sampling from 2000-2002 (WLAP) ▪ Streambed sediment assessment in 2002 (WLAP) 	Partly ²
Chapman Lake	Water quality	<ul style="list-style-type: none"> ▪ Sampled for depth from 1967-1970 (Water Survey of Canada) 	No
Fulton River	Fisheries values	<ul style="list-style-type: none"> ▪ Sampled for flow levels from 1967-1970 (Water Survey of Canada) ▪ Sampled for temp, pH from 1995-1997 (Triton) 	Partly ²

Table 12 – continued

Waterbody	LRMP Value	Water Quality Monitoring Activity	Addresses Need
Bulkley River	Water quality (maintain and restore)	<ul style="list-style-type: none"> Autosampled for flow levels, sediment and selected chemical attributes from 1946-2001 (Water Survey of Canada) Sampled for temp, pH from 1995-1997 (Triton) IBI sampling in 1999 	Partly ²
Telkwa River, and tributaries important to fish spawning	Water quality (maintain and restore) Regionally significant spawning areas	<ul style="list-style-type: none"> Ad hoc sampling (1990-1995) of tribs for suspended sediment (MOF) IBI sampling of several tribs, 2000-2002 (WLAP) Telkwa R. autosampled for flow levels 1975-2001 (Water Survey of Canada) Telkwa R. autosampled for temp 1995-2002 (DFO, WLAP) Sampled for temp, pH from 1995-1997 (Triton) 	Partly ²
Tyhee Lake and tributaries	Domestic water supply; Community Watershed	<ul style="list-style-type: none"> Tyhee Lake sampled and assessed (in 1984 and again in 2001-2002) for temp, suspended sediment, colour, coliform, chemical attributes, against established water quality objectives Tyhee Creek sampled for flow levels in 1983 (Water Survey of Canada) 	[Yes]
Seymour Lake and tributaries	Domestic water supply; Community Watershed	<ul style="list-style-type: none"> Seymour Lake sampled and assessed (in 1984 and again in 2001-2002) for temp, suspended sediment, colour, coliform, chemical attributes, against established water quality objectives Seymour Creek sampled for temp and pH in 1996 (Triton) 	[Yes]
Corya Creek and tributaries	Domestic water supply; Community Watershed	<ul style="list-style-type: none"> IBI sampling in 2000 sampled for temp and pH in 1995-1997 (Triton) 	Partly ²
John Brown Creek and tributaries	Domestic water supply; Community Watershed	<ul style="list-style-type: none"> IBI sampling in 2000 and 2001 sampled for temp and pH in 1995-1997 (Triton) autosampled for flow levels 1947-1949 (Water Survey of Canada) 	Partly ²
Serb Creek	Fish values	<ul style="list-style-type: none"> IBI sampling in 2000 (WLAP) Sampled for temp, pH from 1995-1997 (Triton) 	Partly ²
Copper River, and tributaries important to fish spawning (e.g. Passby Creek)	Water quality Regionally significant spawning areas	<ul style="list-style-type: none"> Many ongoing and historical studies. Full list available on request. 	Partly ²

4.5.5 Data Sources:

Various water quality monitoring studies and report documents (list available on request)

Bulkley Land and Resource Management Plan (March 1998)

Draft Bulkley Aquatic Resource Strategy (November 2003)

5.0 Timber Management

5.1 Introduction:

Figure 22 illustrates the current status (as of 2002) of timber resources in Bulkley TSA, from a harvesting and stand renewal perspective.

The figure shows the forested landbase, and provides a generalized breakdown of age classes in the current Timber Harvesting Landbase. The associated pie chart shows the proportion of the THLB comprised of mature forest (defined for the sake of simplicity as greater than 100 years old) and immature forest (approximately 20-100 years old). It also summarizes the current status of plantations as tracked by the Ministry of Forests Integrated Silviculture Information System (ISIS) by showing the area and proportion of THLB that is non-satisfactorily restocked (NSR), satisfactorily restocked (SR), and free-growing (FG).

The sustainable timber forecast from the most current Timber Supply Review (TSR2) is also included in Figure 23, to provide perspective on what annual volumes can be sustainably harvested from mature stands in the THLB.

LRMP general management direction for timber is to “maintain a sustainable supply of timber for the communities in the Bulkley Plan Area”. This direction suggests the following timber management indicators:

1. prompt reforestation of disturbed areas;
2. maintenance of forest health;
3. a sustained flow of timber to mills within Bulkley Plan Area communities;
4. harvest of the full timber quality profile.

5.2 Timber Management Indicator 1. Prompt Reforestation of Disturbed Areas

5.2.1 Background:

To ensure a sustainable timber supply into the future, disturbed areas should be promptly reforested and actively managed throughout the rotation.

Within Timber Supply Areas:

- licensees have the obligation to reforest all areas harvested after October 31, 1987 within 4-7 years of harvest, and to manage them to a thrifty, “free-growing” state (as defined by MOF establishment to free-growing guidelines) within 8-20 years of harvest.
- the Crown assumes obligation for management of all areas harvested before October 31 1987¹⁰, all licensee free-growing areas, and areas denuded by fire, windthrow and pests.

¹⁰ Licensees assumed full reforestation obligations for certain blocks where harvesting operations had begun but were not completed before October 31, 1987. Block area is grouped with post-October 1987 blocks for reporting purposes.

Figure 22

Generalized Forest Age Distribution in THLB

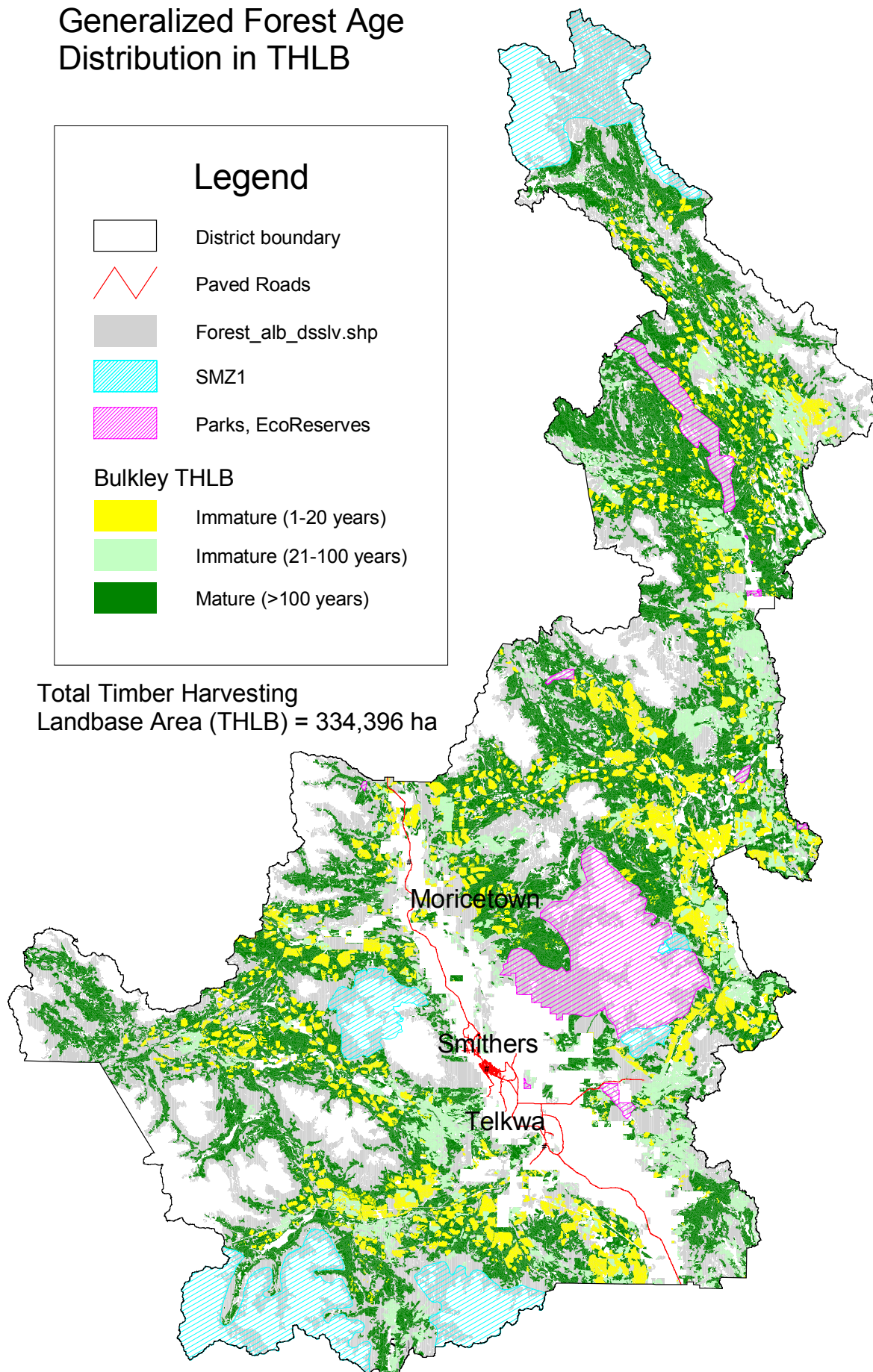


Figure 23

Sustainable Harvest Forecast, Bulkley TSA
(2001)

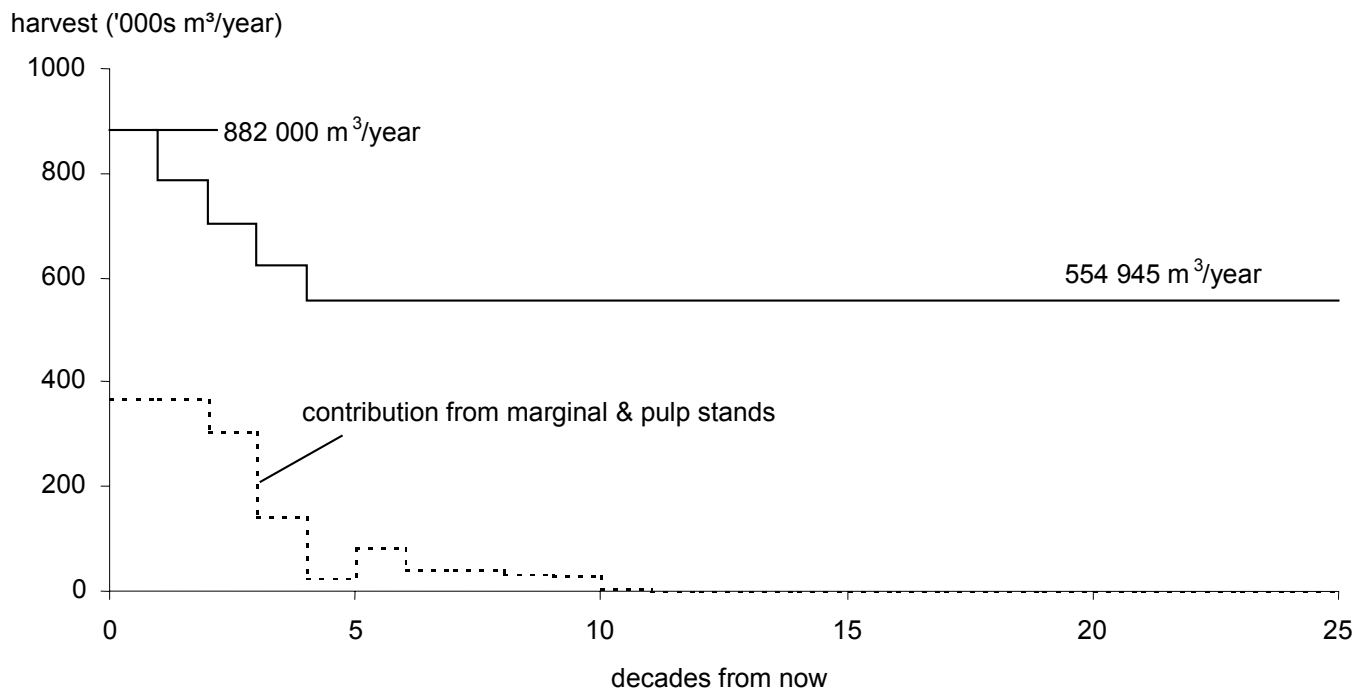
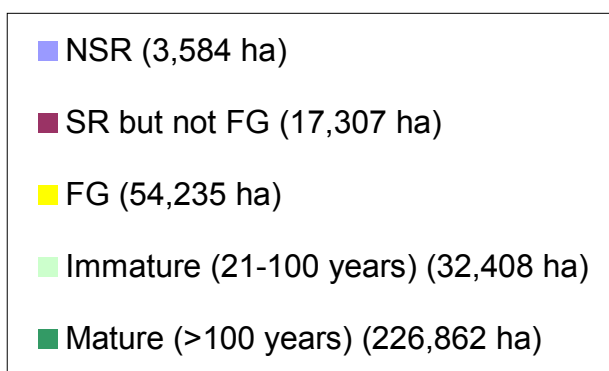
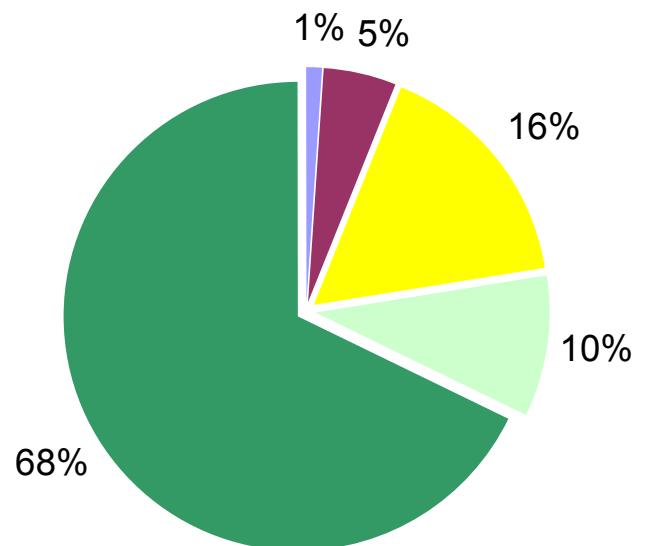


Figure 24

Breakdown of Bulkley THLB by Category, 2002



5.2.2 Measures:

- A comparison of reforested areas versus all area denuded by harvest, fire or windthrow, sorted by obligation
- A comparison of free-growing reforested areas versus all denuded area, sorted by obligation

Areas fully or partially denuded by forest pests are addressed in Timber Management Indicator 2: Maintenance of Forest Health.

5.2.3 Results and Discussion:

Figure 25 shows the area fully or partially denuded by harvest, fire and windthrow in Bulkley TSA according to forest inventory files¹¹. The proportion that is actively managed within silviculture openings, as tracked by the MOF's Integrated Silviculture Information System (ISIS), is also shown.

As the figure indicates, not all areas denuded by wildfire are actively managed. Because of budget limitations, silviculture activities in wildfire areas are generally concentrated in those portions that:

- are accessible and meet criteria that ensure their inclusion in the Timber Harvesting Landbase;
- require treatment, according to criteria set by legislation;
- are economic for treatment, based on cost/benefit analysis;
- have good or medium site productivity, so treatments provide value for expenditure.

The remaining areas are left to develop naturally, and their progress is reported through ongoing forest inventory update (i.e. outside of ISIS).

Figure 26 shows the proportion of net area¹² within openings that has been "reforested" or satisfactorily restocked (SR), and what still remains not satisfactorily restocked (NSR). The figure reveals that significant plantable NSR still remains in post-October 1987 licensee harvested areas. ISIS records indicate 87% of this NSR is in openings harvested within the past 4 years, and 98% is in openings harvested within the past 7 years, so there is a strong likelihood that licensees will meet reforestation obligations within timelines.

Figure 27 shows the proportion of net area within openings that is now free-growing (FG), and what remains not free-growing (NFG). The figure reveals that:

- Over 94% of areas harvested prior to October 1987 have achieved FG status.
- ISIS reports that close to 60% of the remaining NFG areas were harvested 20 or more years ago. There is a strong likelihood that these areas too are FG, but require a field check to confirm that status.
- FG status has been achieved on 49% of BC Timber Sales areas harvested after October 1987, and 59% of areas of industry responsibility. Licensees are well on their way towards achieving FG obligations within timelines.

¹¹ Harvest depletion information was updated to the end of 2002

¹² Net opening area is the total opening area less roads and landings, non-productive or non-forest types, and reserves

5.2.4 Data Sources:

Bulkley TSR3 database

Ministry of Forests Integrated Silviculture Information System (ISIS)

Forest Cover datafiles

Pacific Inland Resources Opening Status datafile

Figure 25

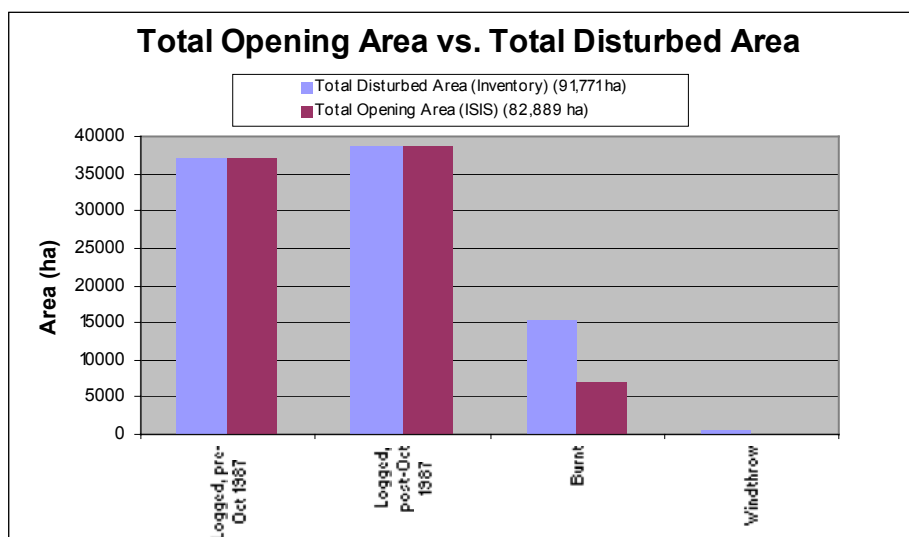


Figure 26

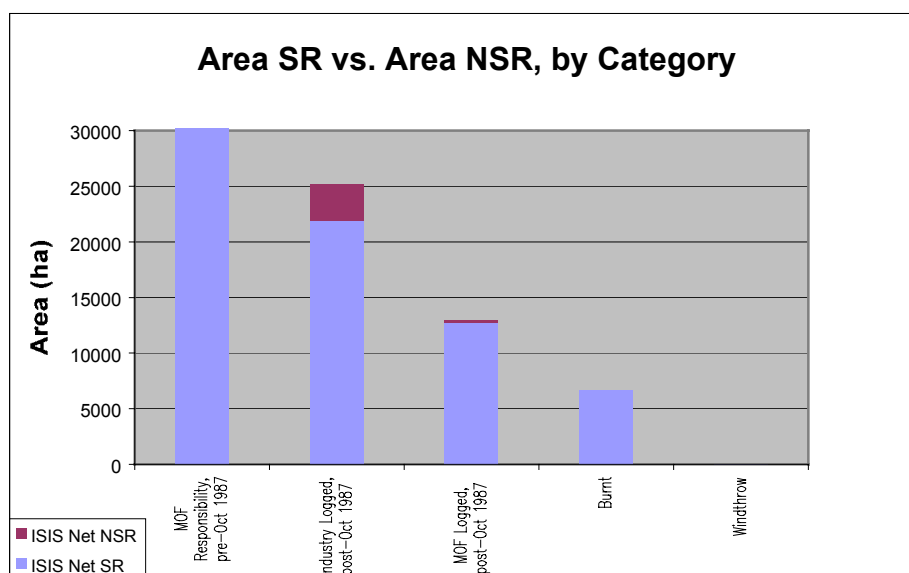
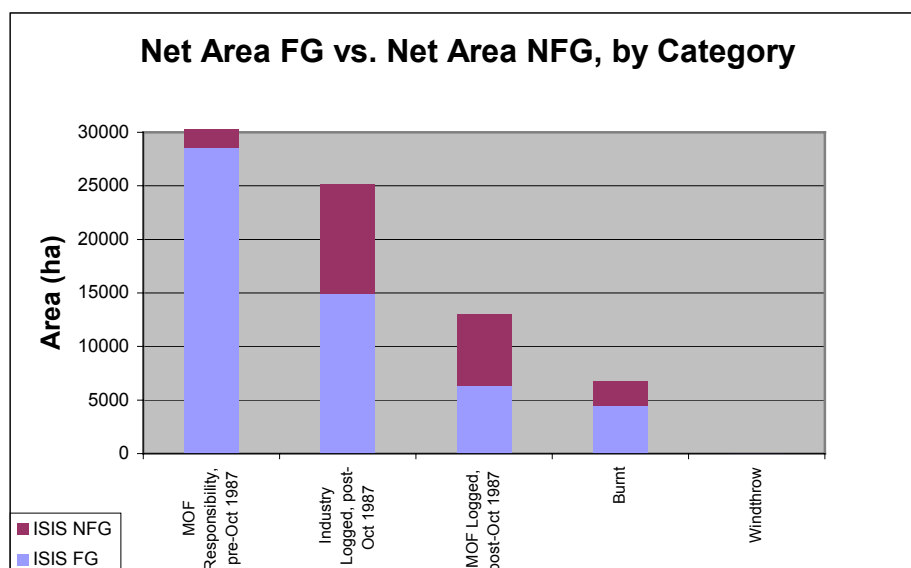


Figure 27

5.3 Timber Management Indicator 2. Maintenance of Forest Health

5.3.1 Background:

Forest health is thought to be maintained if populations of forest health agents (i.e. forest insects and diseases) are controlled.

Forest health agents of concern in Bulkley TSA include mountain pine beetle, balsam bark beetle, spruce bark beetle, *Dothistroma* needle blight, spruce root rot and Aspen-Poplar twig blight. Spruce budworm, certain pests of young stands (e.g. stem rusts, leader weevils, *Mycosphaerella* needle blight), and other forest health agents¹³ are also present, but occurrences are isolated. To date, no forest health agent has reached epidemic population levels within TSA boundaries.

In Bulkley TSA, forest health agent assessment and control practices take different forms, depending on the agent of concern.

Mountain pine beetle (IBM), Spruce bark beetle (IBS)

These forest pests are stand-level mortality agents of commercially valuable tree species, so are intensely controlled.

- GPS'd waypoints are mapped for concentrated areas of recently killed timber, based on District-based aerial surveys.
- Waypoints are ground-probed for beetle presence.
- Depending on the size of population, recommended treatment is on an individual tree basis (e.g. trap trees, fall and burn) or on an opening basis (e.g. harvesting of brood areas, or incorporation into cutblocks).
- Babine Corridor Park is a known concentration area for beetle populations. Special Beetle Management Areas (BMA's) have been set up to concentrate beetle outflow from Babine Corridor Park into BMA high hazard areas, for subsequent control through sanitation harvest or other suitable treatment.

Balsam bark beetle (IBB)

Balsam bark beetle has not been actively controlled in this TSA because:

- it is widespread throughout balsam-leading stands at higher elevations, historically at light intensity levels. It's considered a chronic, endemic pest;
- many of these stands remain inaccessible;
- control methods used for IBM and IBS are considered ineffective for this pest;
- it was thought to be an individual tree versus a stand-level mortality agent, so of minimal concern. However, attack has resulted in about 5% mortality per year, and over time significant stand-level mortality has occurred.

In contrast with IBM and IBS, IBB attack areas are mapped at a broad scale during provincial aerial overview surveys. Control is indirect, through incidental harvest.

¹³ The Bulkley Forest Health Plan (November 2000) has a comprehensive list of pests that are known to be present in Bulkley TSA. This document is available for download at <http://www.for.gov.bc.ca/dss/>

***Dothistroma* needle blight**

- affects young pine and spruce stands, primarily in the ICH; can result in stand-level mortality
- becoming increasingly widespread since 2001
- no mapping currently available for Bulkley, but known to be present in most pine-leading plantations in the ICH and most significantly in Evelyn Pasture.
- treatment is silvicultural, i.e. underplant with mixed species or non-host species.

***Tomentosus* root rot**

- interior spruce stands of all age classes are highly susceptible. Lodgepole pine, western hemlock, Sitka spruce, and sub-alpine fir are moderately susceptible.
- not mapped, but all spruce stands are considered at risk. TSR2 assumes up to 18,000 m³/year mortality, which translates to an average of 60 ha/year.
- Control is silvicultural (i.e. plant with mixed species or non-host species; avoid planting adjacent to infected stumps).

Aspen-Poplar twig blight

- attacks trembling aspen, balsam poplar and cottonwood. Large area of severe intensity attack in Bulkley TSA in 2002.
- mapped at a broad scale during provincial aerial overview surveys.
- not controlled

Other pests

- mapped at provincial overview level, or mapping not available.
- pests are known to be present, but have scattered and isolated occurrence and are presently at endemic levels.
- controlled indirectly through application of silvicultural strategies (e.g. reforestation with non-host tree species, or with a mix of species to diffuse impacts; increasing planting densities, etc.).

5.3.2 Measures:

1. IBM, IBS - waypoints mapped versus waypoints controlled, by year (hazard context provided by overlaying with maps of areas of moderate to high susceptibility).
2. IBB, other pests (*Dothistroma*, aspen-poplar twig blight, spruce budworm)
 - extent of mapped infestation areas (based on provincial aerial overview mapping).

5.3.3 Results and Discussion, Measure 1:

Figures 28 and 29 show mapped beetle waypoints (by year of mapping) over a base of areas at moderate to extreme hazard to mountain pine beetle and spruce bark beetle attack, respectively. Table 13 reports on the number of these waypoints treated in 2001 and 2002 that were the responsibility of the Small Business Forest Enterprise Program

(forest industry waypoint actioning information was not available). SBFEP waypoints that were not treated were either inaccessible, or didn't require treatment because beetles were no longer present. The proportion of waypoints that required some treatment (25% in 2001, 31% in 2002) provides some perspective on total beetle population size.

The figures indicate that outbreaks have been kept to endemic levels from 1999-2002, most likely due to the intensity of control effort. In the case of mountain pine beetle, it may also be a factor of the scattered nature of stands at hazard to attack.

Table 13 – Waypoint Actioning Information for Small Business Forest Enterprise Program: 2001, 2002

Year	Pest	Treatment					Totals:
		Fall & Burn	Incorporate into Cut Block	Pheromone	Trap Tree	Brood Removal	
2001	IBM	14	1	16			31
	IBS		2	33	8	30	73
Totals:		14	3	49	8	30	104

Total SBFEP waypoints, 2001 409

Total waypoints for 2001 1394

2002	IBM	83		10			93
	IBS	3		8			11
Totals:		86		18			104

Total SBFEP waypoints, 2002 332

Total waypoints for 2002 1075

5.3.4 Results and Discussion, Measure 2:

Figure 30 shows the extent of balsam bark beetle attack on forest stands at moderate to extreme hazard. The figure illustrates a significant increase in moderate to severe attack intensity¹⁴ in recent years, although the regional entomologist believes a significant portion of moderate intensity attack areas may actually be mistyped light intensity.

Figure 31 provides similar information for other pests for which provincial aerial overview mapping is available (Aspen-Poplar Twig Blight, *Mycosphaerella* needle blight, and 2-Year Cycle Spruce Budworm). For the most part, the figure indicates that incidence is scattered. Aspen-Poplar Twig Blight attack areas have increased in 2002, but attack severity is predominately light to moderate.

¹⁴ Provincial Health Overview Mapping: Light intensity = <10% recent mortality of susceptible tree species in mapped area; Moderate intensity = 10-30% recent mortality; Severe intensity = >30% recent mortality

5.3.5 Data Sources:

Ministry of Forests Forest Health Aerial Overview flights 2000, 2001, 2002

PMOIS “Pest_Be” database

Bulkley Forest Cover, 1997 Inventory

Field Guide to Forest Damage in BC

(http://www.for.gov.bc.ca/hfp/forsite/pest_field_guide)

Bulkley SBFEP Beetle Management Area Strategy (May 2002)

Figure 28

Mountain Pine Beetle:
New Waypoints by Year,
1999-2002

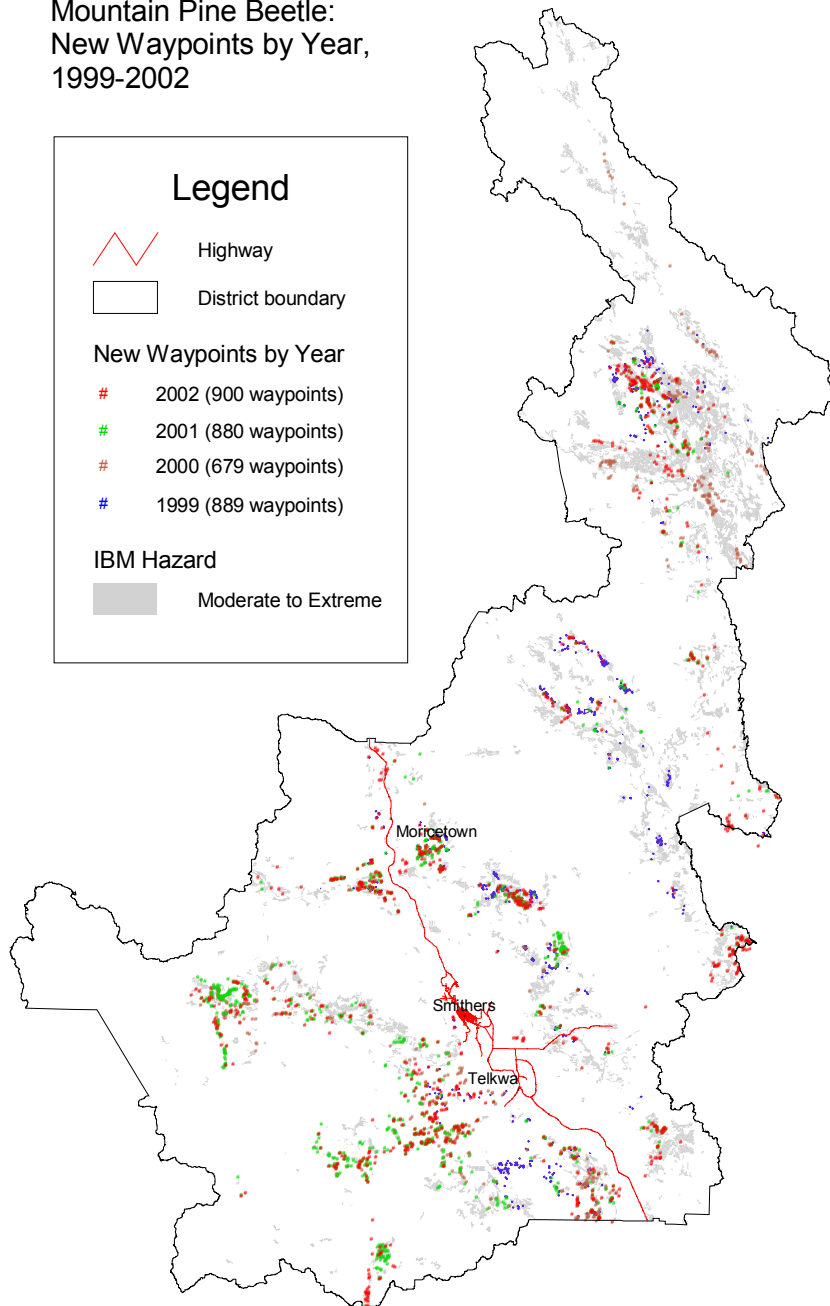


Figure 29

Spruce Bark Beetle:
New Waypoints by Year,
1999-2002

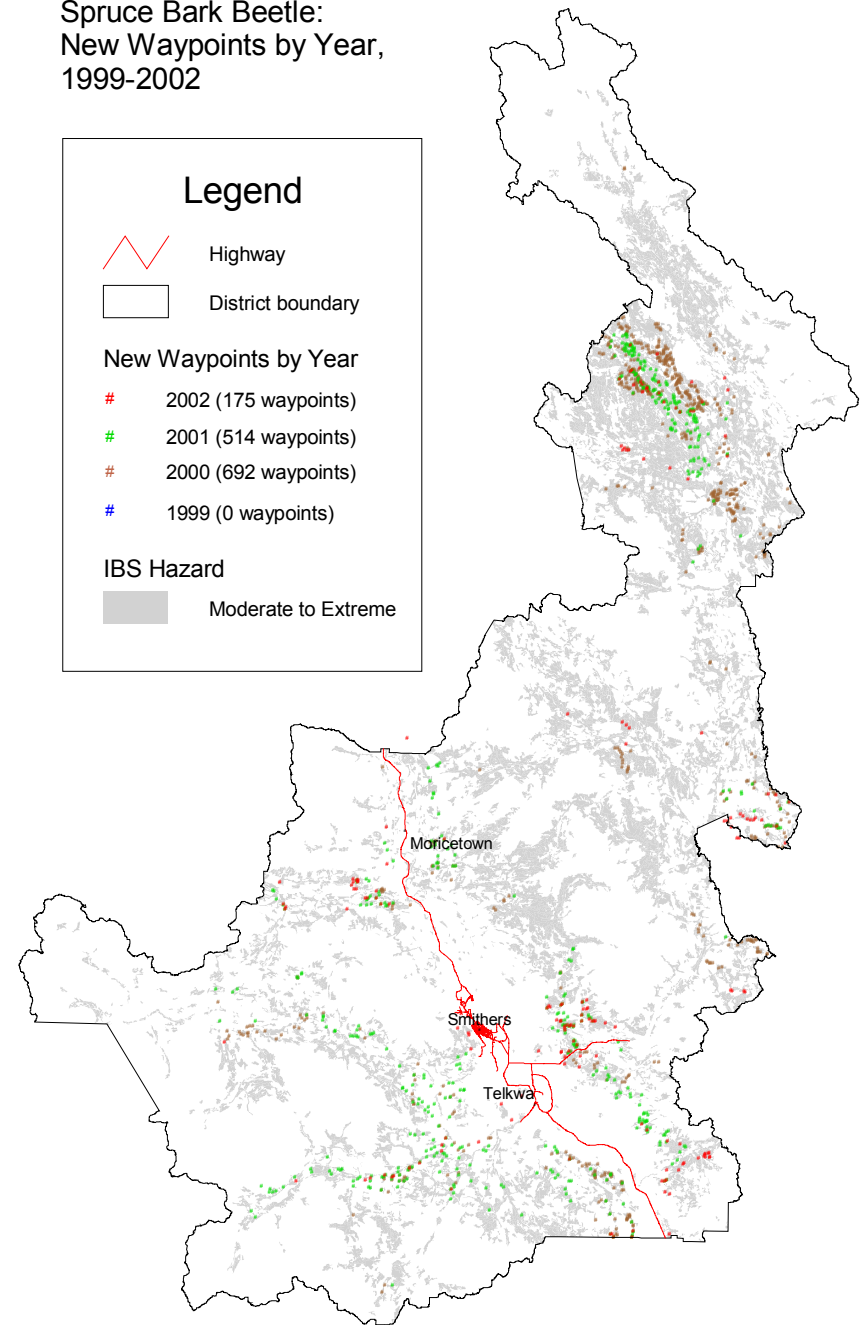


Figure 30

Western Balsam Bark Beetle:
Provincial Overview Mapping,
Moderate to Severe Attack Intensity

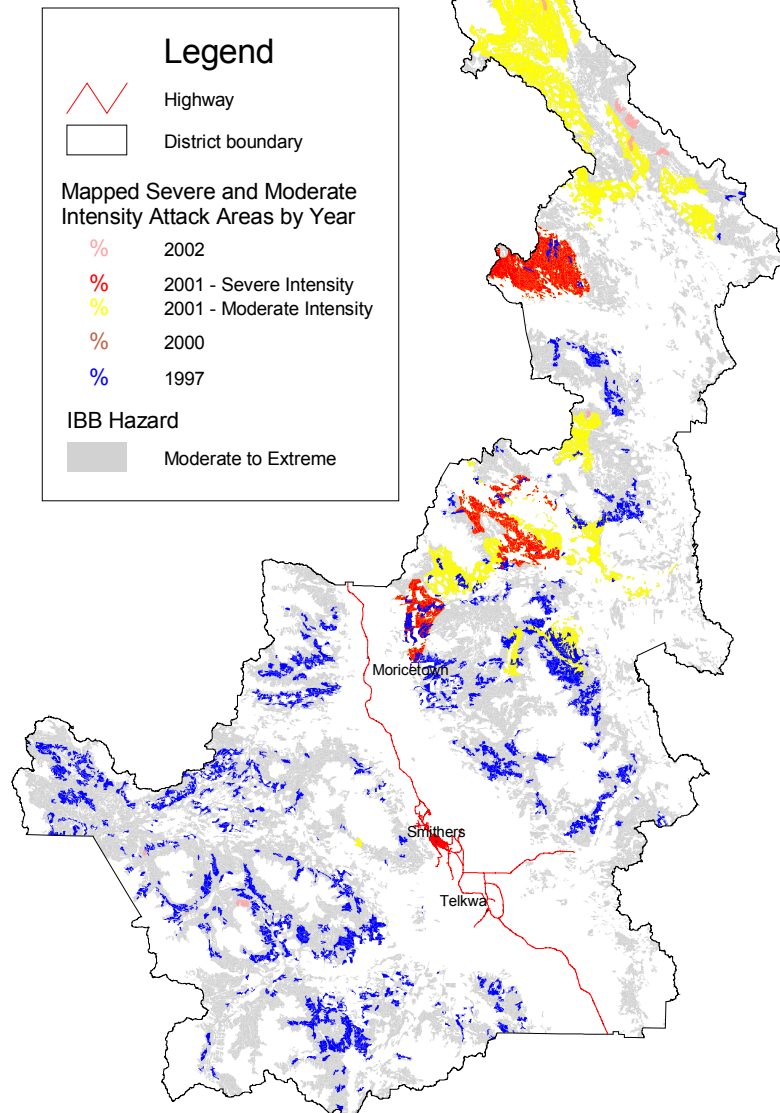
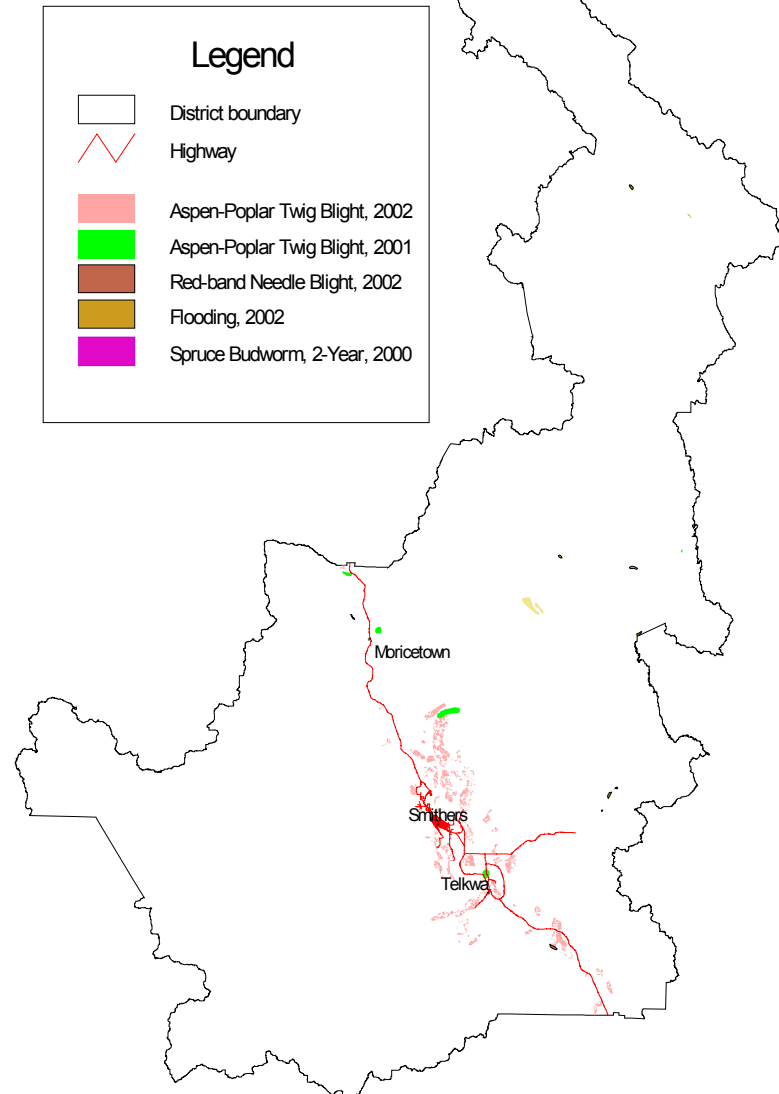


Figure 31

Other Forest Health Concerns
Provincial Overview Mapping,
Light to Severe Attack Intensity



5.4 Timber Indicator 3. Sustained Flow of Timber to Local Mills

5.4.1 Background:

Maintaining a sustained flow of timber harvest over time to local mills is a key factor in maintaining the economic stability of forest-dependant communities, such as those present within Bulkley Timber Supply Area (TSA).

One can assess whether or not the volume of timber harvested in a timber supply area is sustainable, by determining if harvest is at or below the Allowable Annual Cut level established by the Chief Forester through Timber Supply Reviews conducted every 5 years. One can also determine if the volume of timber harvested in the TSA contributes to the stability of communities present in the TSA, by assessing what proportion is processed by local mills.

5.4.2 Measures:

1. Volumes harvested¹⁵ and billed to cut control¹⁶ in Bulkley TSA versus volumes permitted for harvest under the Allowable Annual Cut.
2. Volumes harvested and billed to cut control in Bulkley TSA versus volumes processed by local mills.

5.4.3 Results and Discussion, Measure 1:

As Figure 32 illustrates, the billable volume of wood harvested in the Bulkley Timber Supply Area (TSA) for the years 1987 to 2002 was essentially at or below the Allowable Annual Cut (AAC) level set by the Chief Forester.

There has been a trend to less harvest in Bulkley TSA since 1996 as a result of:

- closure of local mills, including Skeena Cellulose, Seaton Lumber, and Alpine Cedar Products;
- trade tariff issues with the United States: the primary market for local wood products

To address the mountain pine beetle epidemic affecting the northwest region of the province, Bulkley's major licensees (Pacific Inland Resources and BC Timber Sales) have transferred the bulk of their operations to Lakes and Vanderhoof TSA's. As Figure 32 indicates, there was a significant drop in volumes harvested in Bulkley TSA in 2002 as a result of this shift.

¹⁵ Volumes are reported for harvest under replaceable and non-replaceable forest tenures and forest service reserve. Harvested volumes from woodlots and private land are excluded.

¹⁶ Under the terms of license agreements for major forest tenures, harvested volumes are required to be within 10% of apportioned volume targets at the end of the "cut control" period, which is generally set at 5 years. The license also establishes specifications for what grades are billed to cut control – most licenses require mandatory utilization of sawlog grade (grade "blank"), and dry sawlog (grade 3) if harvest is for salvage of timber killed by fire or pests. Some licenses require mandatory utilization of all log grades (i.e. grades "blank", 3, 4, 5 and 6).

A summary document of Bulkley licenses and apportioned volumes can be downloaded from:
<http://www.for.gov.bc.ca/ftp/hth/external/!publish/apportionment/bulkley.pdf>

5.4.4 Results and Discussion, Measure 2:

Figure 33 illustrates (for 1994-2002) what proportion of timber harvested and billed to cut control in Bulkley TSA was processed at local mills, versus what was processed at mills outside the TSA. On average more than 70% is processed at local mills, which indicates that Bulkley timber contributes significantly to sustaining local forestry employment.

Local mills also process a significant volume of timber from other TSA's each year. Figure 34 illustrates for a sample year (2000) what proportion of timber processed at local mills was from sources outside the TSA.

5.4.5 Sources:

Ministry of Forests Harvest Billings Data Base

Figure 32

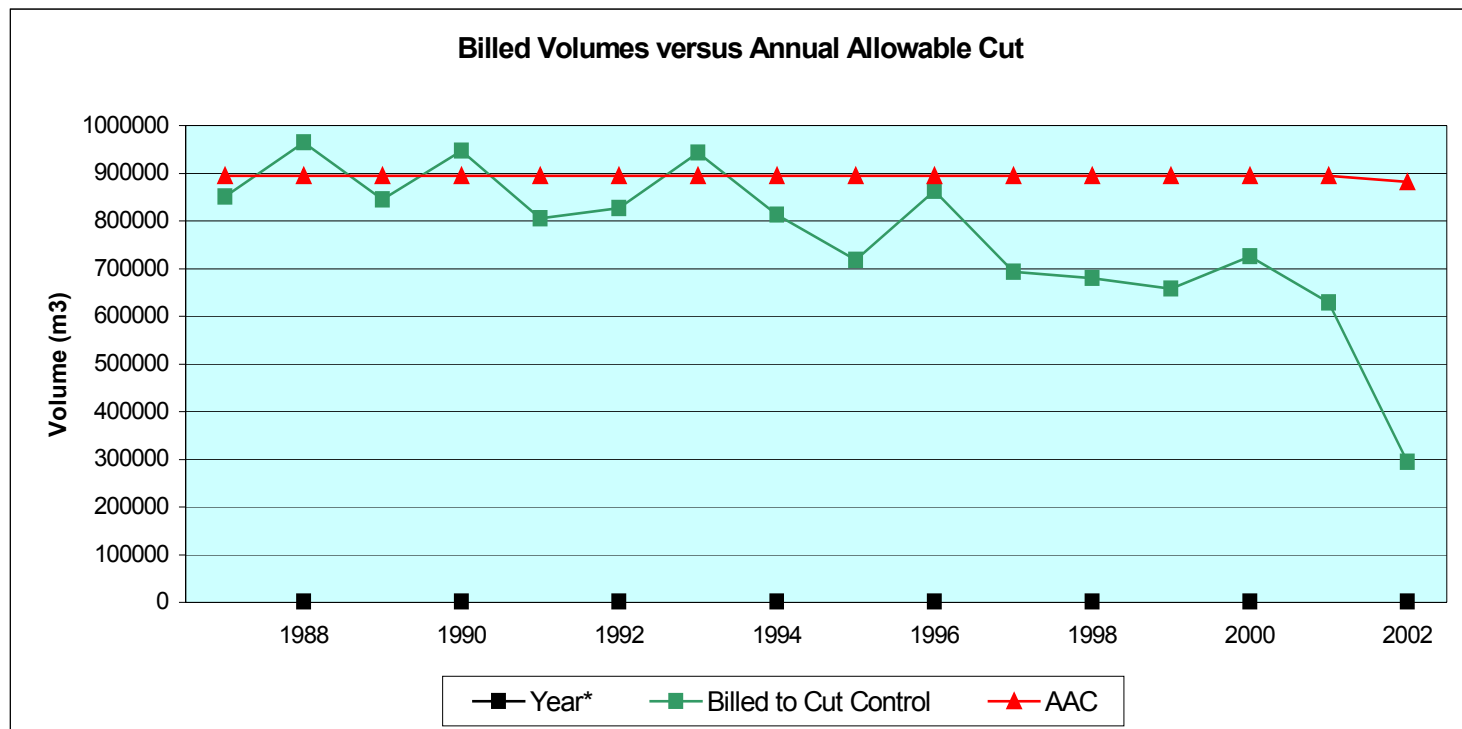


Figure 33

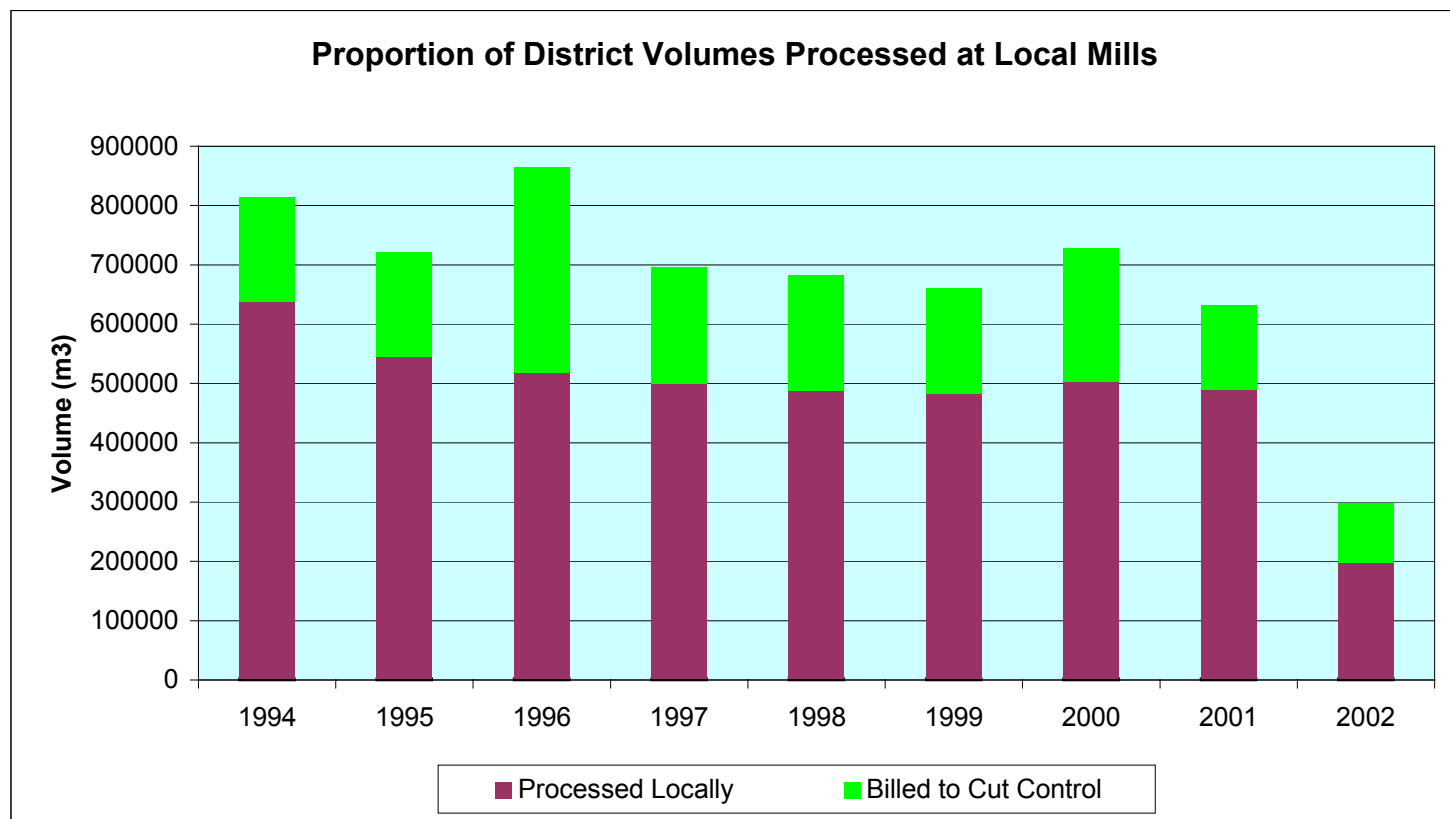
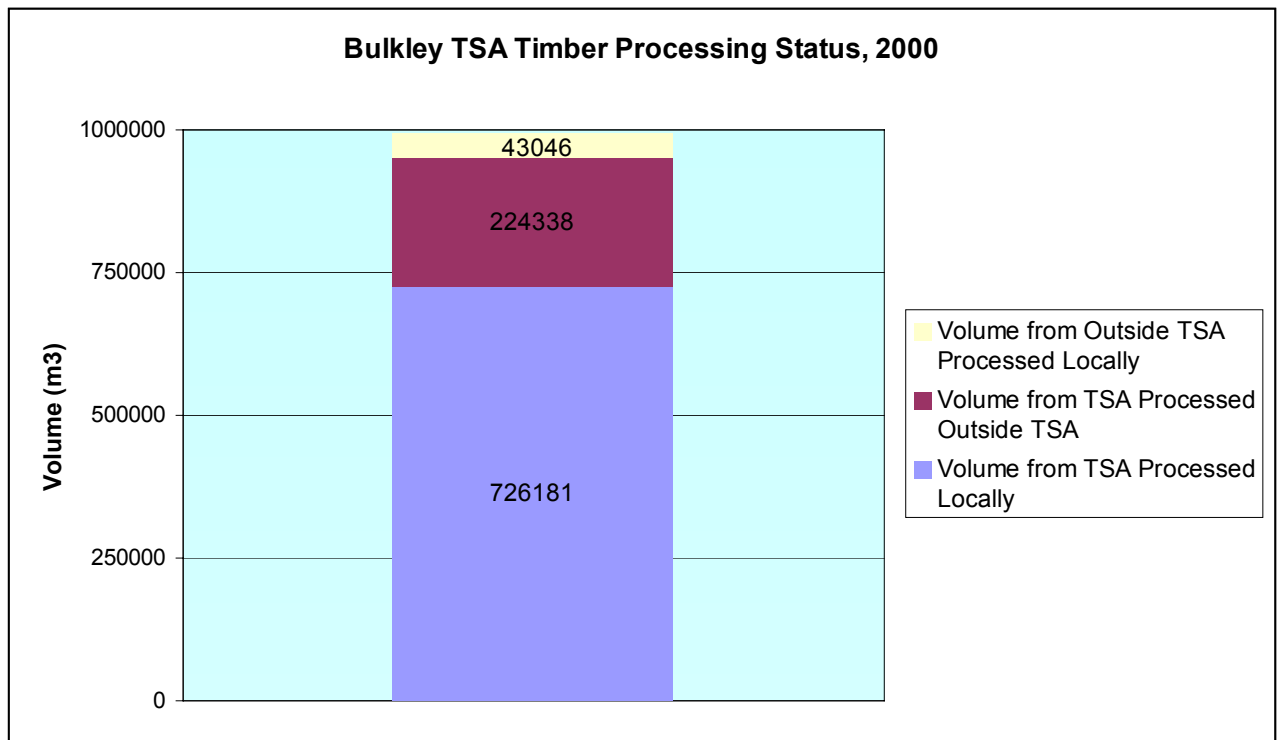


Figure 34 Bulkley TSA Timber Processing Status, 2000



5.5 Timber Management Indicator 4. Harvesting the Full Timber Quality Profile

5.5.1 Background:

From a simplified harvest economics viewpoint there are two stand categories that occur in Bulkley TSA: those that yield a relatively higher proportion of lower value or poor-quality timber (i.e. small piece size; pulp grades), and those that yield a relatively higher proportion of more valuable sawlog-quality timber. Except when there is a peak in pulp commodity prices, harvest focus is often placed on the latter category. Left unmanaged, this situation could result in a deficit of stands of sawlog-quality timber within the next few decades, which would have a destabilizing effect on local mills.

Since the mid-1980's Bulkley MOF and forest licensee staff have worked collaboratively to select forest cover attributes that accurately quantify stand quality. They determined that 59% of the Bulkley TSA stand quality profile was comprised of stands of primarily sawlog quality timber, and 41% of stands of primarily marginal sawlog or pulp quality timber.

In his 1995 Allowable Annual Cut (AAC) determination (and again in his 2001 AAC determination) BC's Chief Forester established a partitioned AAC for Bulkley TSA. Of the total 895 000 m³ AAC (set to 882 000 m³ in 2001), 41% of the harvesting profile (367 000 m³/year prior to 2001; 362 000 m³/year from 2001 to present) was to be from stands of marginal sawlog or pulp quality timber.

District staff were directed to monitor harvest performance in this partition. If performance was inadequate, the landbase associated with this partition could be removed from the timber harvesting landbase (THLB) in a subsequent AAC determination, and the AAC adjusted to a level appropriate to a reduced THLB.

To ensure harvest in the marginal sawlog/pulplog partition, special non-replaceable "opportunity wood" licenses have been established, and existing replaceable license agreements modified. This section summarizes District partition monitoring results for these licenses.

5.5.2 Measure:

Performance with respect to the Chief Forester's partition timber quality profile.

5.5.3 Results and Discussion:

Figure 35 illustrates harvest performance with respect to AAC levels set for the sawlog and the marginal sawlog/pulp partitions, for the years 1995 to 2000. The figure reveals a consistent undercut in the marginal sawlog/pulp-log partition. Harvest in the sawlog partition was closer to target levels.

5.5.4 Recommendations:

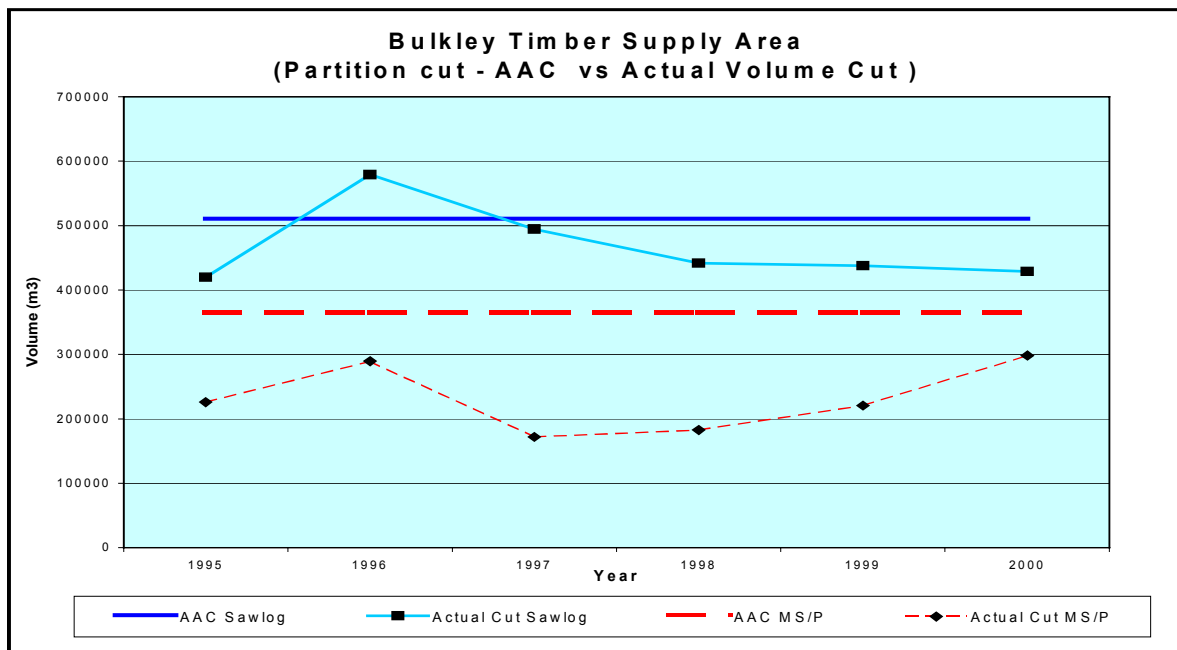
The undercut in the marginal sawlog/pulp partition is attributable to poor pulp commodity prices during the period monitored. Because 50% or more of target AAC was

consistently achieved for this partition type, District staff recommended that the associated landbase be kept in the THLB for the Chief Forester's 2001 AAC determination.

5.5.5 Data Sources:

1995-2001 Cut Control Letters, for individual licenses
Bulkley District Partition Tracking database

Figure 35 - Partition Harvesting Rates, 1995-2000



6.0 Visual Quality

6.1 Introduction:

As stated in the Bulkley LRMP, the scenic resources of the Bulkley timber supply area are critical to the viability of the tourism recreation sector and to the quality of life of area residents. Scenic quality is a major factor in recreational use, and forest landscapes provide a scenic backdrop that is highly valued by the public and by the tourism industry.

6.2 Visual Quality Indicator 1. Visual Quality of Timber Harvesting

6.2.1 Background:

Timber harvesting can have a major effect on the quality of the visual landscape. Visual quality objectives for harvesting activities are provided in Landscape Unit Plans (LUP's), for visually sensitive areas as seen from major highway and river corridors, recreation focus points, and specific viewpoints listed in the Bulkley LRMP¹⁷.

Visual quality objectives (VQO's) are as follows:

- Preservation VQO - forest management activities cannot be visible from designated viewpoints.
- Retention VQO - forest management activities may be discernible but not clearly visible to the average viewer. Disturbances must appear to be from natural causes.
- Partial Retention VQO - forest management activities may be noticeable but must blend well with the natural appearance of the landscape.
- Modification VQO - forest management activities must have natural appearing characteristics, and blend in with existing landforms.

No area-based disturbance targets have been established because visual quality is a subjective value and may be perceived differently by any viewer. Licensees instead must:

- demonstrate that proposed development achieves VQO's, by providing Visual Impact Assessments (i.e. simulation of what the visual landscape will look like post-harvest) from designated viewpoints for public review. Figure 36 provides an example, for a controversial block visible from a viewpoint on Highway 16 near Moricetown;
- manage existing openings to a visually effective greenup height (3 metres in Modification, 5 metres in Partial Retention, Retention and Preservation VQO areas) prior to harvesting areas contiguous to existing openings.

This section reports on current performance towards meeting visual quality objectives.

6.2.2 Measure: Proportion of openings in VQO areas that meet visual quality objectives

¹⁷ A weblink to a listing of specific viewpoints is under construction.

6.2.3 Proposed Future Measure: weblink to current views of visually sensitive landscapes, from all identified viewpoints, to facilitate judgement by public as to whether or not objectives are being achieved.

6.2.4 Results and Discussion:

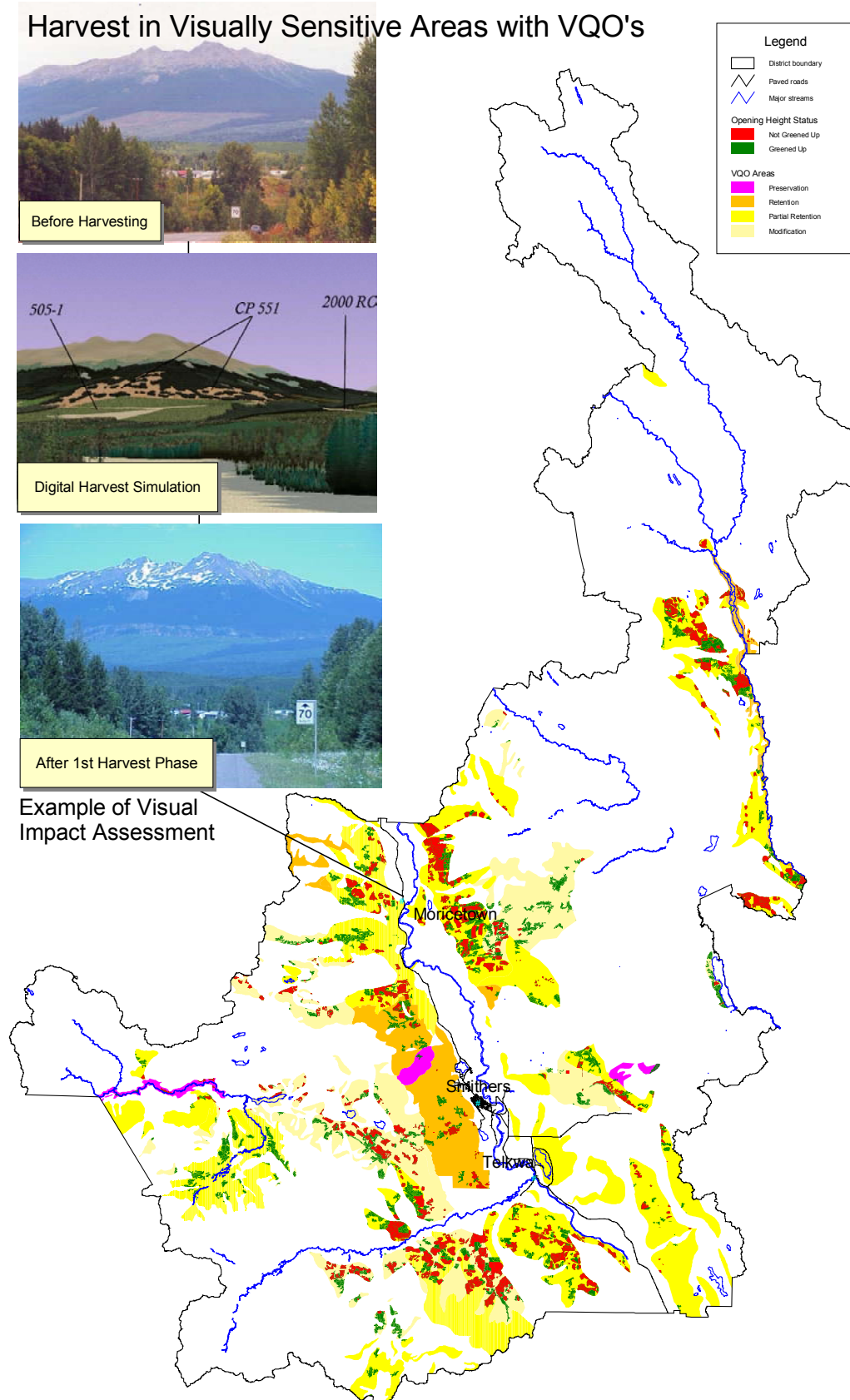
Figure 36 depicts areas with Visual Quality Objectives, and illustrates the proportion of openings within those areas that have achieved visually effective greenup.

To date, 100% compliance in meeting VQO objectives has been achieved on harvest proposals submitted since the LRMP came into effect, because licensees have adjusted block boundaries, increased the proportion of reserved stems, or dropped blocks to accommodate government and public concerns expressed during Forest Development Plan review periods.

6.2.5 Data Source:

Bulkley Landscape Unit Plans
VQO digital coverage
TSR3 database

Figure 36



7.0 CULTURAL HERITAGE RESOURCES

7.1 Introduction:

The Bulkley LRMP directs agencies to:

- Minimize the impact of development on both archaeological and traditional use sites, consistent with:
 - the Heritage Conservation Act, which allows for an area to be preserved;
 - Forest Practices Code Act provisions, which identify when archaeological inventories are required prior to development;
 - the Protocol Agreement [between the Minister of Forests and the Minister of Small Business, Tourism and Culture] on the Management of Cultural Heritage Resources, which establishes the roles of the two ministries in assuring the integration of cultural heritage resources in land and resource management planning and operations;
 - British Columbia Archaeological Impact Assessment Guidelines.
- Incorporate recommendations from Archaeological Overview Assessments/ Archaeological Impact Assessments into operational plans.
- Consult with First Nations on development plans, as guided by consultation protocols.

7.2 Cultural Heritage Resources Indicator 1. Management of Cultural Heritage Resource Features

7.2.1 Background:

The **Cultural Heritage and Archaeological Resources Inventory** (CHARI) is a November 2000 District Manager Policy that has the following components:

- An inventory of currently known cultural heritage resource features (archaeological sites, traditional use sites, trails, etc.).
 - Information sources include traditional use studies, archaeological inquiry, archives, oral history from elders, research of historical documents, and work by field crews.
- A map showing where cultural heritage resource features have the potential to occur (Figure 37). Potential areas (i.e. high, moderate, moderate-low and low probability of CHR occurrence) are mapped by buffering features identified in the above inventory.
 - The mapping process and map product is somewhat comparable to that for Archaeological Overview Assessments, with the introduction of some local modifications to improve predictive capability.

- A decision matrix prescribing a level of survey.
 - Known archaeological site recorded in the Provincial Heritage Resource Database maintained by Archaeology Branch – requires an Archaeological Impact Assessment (AIA).
 - High cultural heritage resource potential – requires a combined cultural heritage (CH) reconnaissance/ culturally modified tree (CMT) survey and consultation with local 1st Nations. May require an AIA depending on recce/ survey results.
 - The intent and scope of the CMT Survey is defined in the May 4, 1999 **District Manager's Policy for Culturally Modified Trees**
 - CMT's marked pre-1846 are considered archaeological sites under the Heritage Conservation Act, and must be protected from harvest.
 - CMT's marked post-1846 may have cultural significance, thus must be reserved from harvest until proper 1st Nations consultation has occurred.
 - Moderate or lower potential – requires that field layout work be conducted by personnel trained to recognize cultural heritage features. Requires CH recce/CMT survey if features are discovered.
- Direction for forest management around cultural heritage features.

7.2.2 Interim Measures:

- 1) Progress towards development of forest management guidelines that accommodate cultural heritage resource features.
- 2) Site-level measures undertaken to protect CHR's/CMT's

7.2.3 Future Measures:

Number of features protected from harvest (or not requiring isolation or protection from harvest) as a result of consultation, versus number of known features associated with harvested area, since approval of CHARI and CMT Policies. Sorted by category of CHR feature.

7.2.4 Results and Discussion:

Figure 37 provides a simplified depiction of the map component of the CHARI. It would be erroneous to infer from the presence of this map that all archaeological and traditional use features have been inventoried in the Bulkley TSA. The CHARI is a living document, and is meant to be updated as new information becomes available. The CHARI and CMT Policy do provide a suitable framework for application of forest management guidelines that accommodate all known cultural heritage resource features.

Management of cultural heritage resource (CHR) features occurs at the site level, and is addressed within silviculture prescriptions/ site plans in adherence to direction from legislation, CHARI and CMT Policies, and Archaeological Impact Assessments.

Figure 38 provides two representative examples of how a harvest unit is designed to incorporate known CHR features. In both these examples cultural resource features have either been placed into reserves or buffered from harvest.

Prescribed forest management activities commonly include:

- incorporation of features into buffered reserves;
- exclusion from block boundaries;
- harvest deferral;
- harvest cessation;
- for pre-1846 CMT's, possibly a form of modified harvest (e.g. stubbing of stem above the cultural marking) depending on the recommendations of an Archaeological Impact Assessment;
- for post-1846 CMT's, possible full harvest of CMT's if consultation with 1st Nations reveals they are not culturally significant.

Figure 37

Cultural Heritage/Archaeological Resource Potential

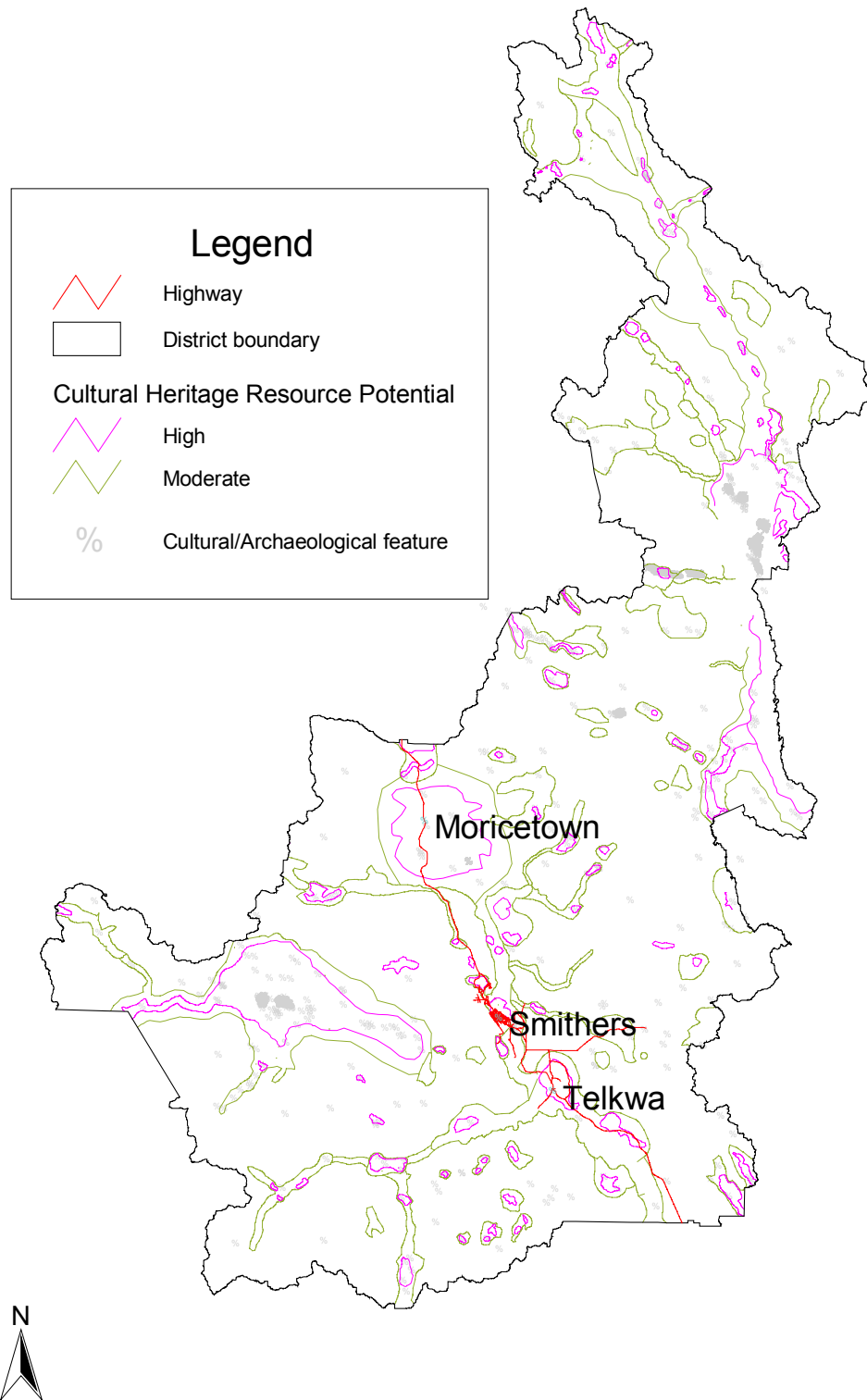
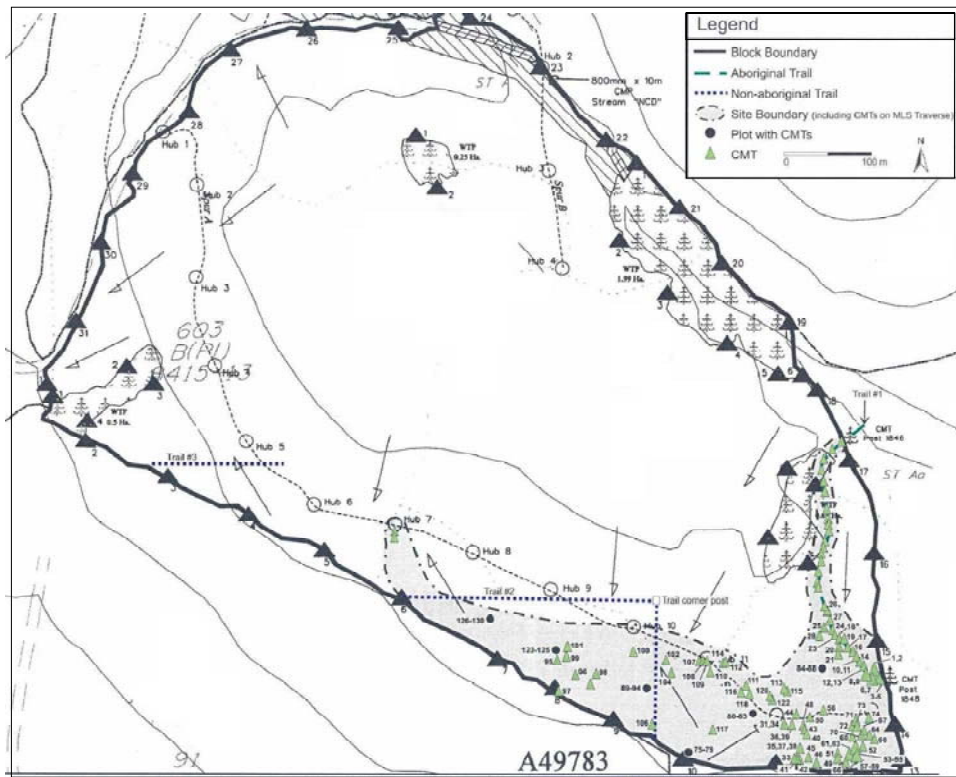
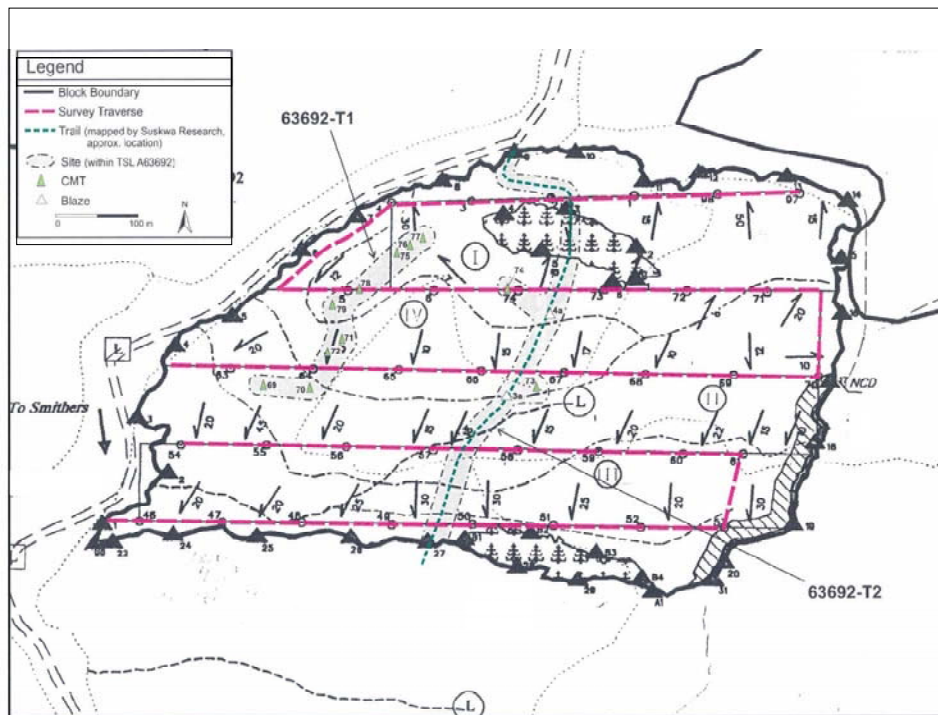


Figure 38

Examples of Block Designs that Incorporate Cultural Heritage/ Archaeological Resource Features



8.0 Access

8.1 Introduction:

“Access” was not perceived by the LRMP table as being a value in itself, but as having direct influence on the value of other resources. Whether access has a positive/negative connotation depends on the value under consideration and the viewpoint of the resource user. For perspective on this topic, focus is placed on the following indicators:

1. Access to facilitate natural resource management/extraction
2. Recreational access, focusing on backcountry or wilderness experiences
3. Access to candidate wilderness lakes
4. Circle routes
5. Access development in sensitive terrain

8.2 Access Indicator 1. Access to Facilitate Natural Resource Management/Extraction

8.2.1 Measures:

- Proportion of accessed TSA vs. total TSA (to focus on access to all resources).
- Proportion of accessed forested/timber harvesting landbase in TSA vs. total forested/timber harvesting landbase (to focus on access to the forest resource)

8.2.2 Results and Discussion:

Table 14 reports on the proportion of the Timber Supply Area (i.e. total area, forested area, and current Timber Harvesting Landbase (THLB) area) that is within 1 and 2 km, respectively, of access infrastructure as it exists in 2002. The proportion of the landbase within 1 km of access infrastructure as it existed in 1997 has also been added: it highlights the rapid increase in landbase availability to resource management and extraction that has occurred over the past few years.

Focus is placed on area that is within 1 to 2 km of existing infrastructure: this area is considered “accessible” in that it can be accessed with minimal new access development. The table reveals that the THLB is close to being fully accessible to timber extraction.

Table 14 – Accessed TSA vs. Total TSA Area

	Year	Total Area	% of TSA Total Area	Forested	% of TSA Forested	THLB	% of TSA THLB
TSA totals	-	762733	100	533312	100	334396	100
1k buffer	1997	354611	46	261524	49	194357	58
1k buffer	2002	415046	54	315521	59	237122	71
2k buffer	2002	521822	68	397937	75	281416	84

8.2.3 Data Sources

- 1997 update forest cover (FC1) roads, from Bulkley District data hub
- 1999 update FC1 roads, supplemented with Bulkley BCTS Road ledger (2002 update) GPS'd roads and additional roads identified in PIR's 2000-2009 Forest Development Plan.
- TSR3 datafile (to derive TSA-level coverages for THLB and forested)

8.3 Access Indicator 2. Recreational Access, Focusing on Backcountry or Wilderness Experiences

8.3.1 Measure:

The changing proportion of total TSA area classed as “Primitive”, “Semi-Primitive Non-Motorized” and “Semi-Primitive Motorized” through Recreation Opportunity Spectrum mapping.

[Future measure – status of “budget” of more primitive ROS categories]

8.3.2 Results and Discussion:

The BC Ministry of Forests uses the Recreation Opportunities Spectrum (ROS) classification system to measure how recreation experiences in a given area may vary depending on its remoteness, naturalness and potential for human contact.

ROS classes include:

- **Primitive (P):** more than 8 km from a road, more than 5000 ha in area, no motorized use, very high naturalness.
- **Semi-Primitive non-motorized (SPNM):** more than 1km from a road, more than 1000ha, very little motorized use, few human encounters.
- **Semi-Primitive motorized (SPM):** more than 1km from road, more than 1000ha, low motorized use, few human encounters.
- **Roaded Natural:** up to 1km from road, moderate motorized use, moderate chance of meeting others.
- **Roaded Modified:** high level motorized use, low degree naturalness, high chance of meeting others.
- **Rural:** farmland, settlement patterns.

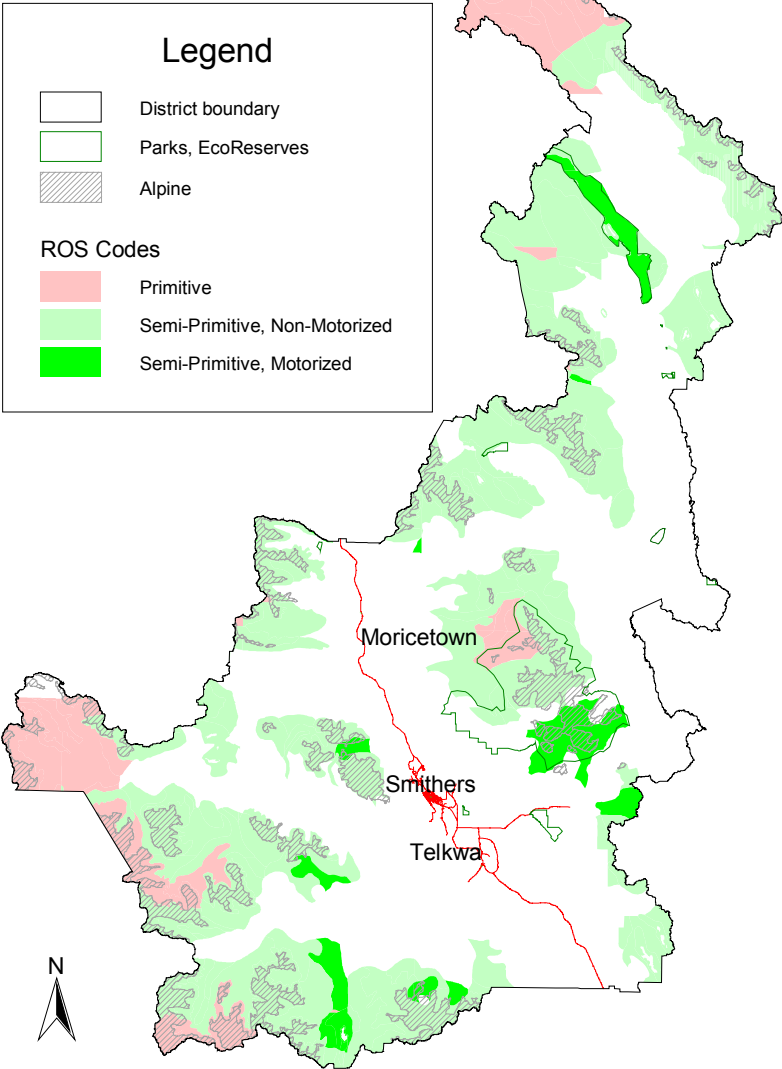
Because this indicator stresses backcountry or wilderness experiences, focus is placed on the changing proportion of the TSA in the first three ROS classes (i.e. P, SPNM and SPM). Table 15 and Figure 39 below show the results of a comparison between 1983 ROS mapping and a 2002 ROS modelling exercise.

Table 15 – TSA Area by ROS Class; 1983 and 2002 ROS Mapping

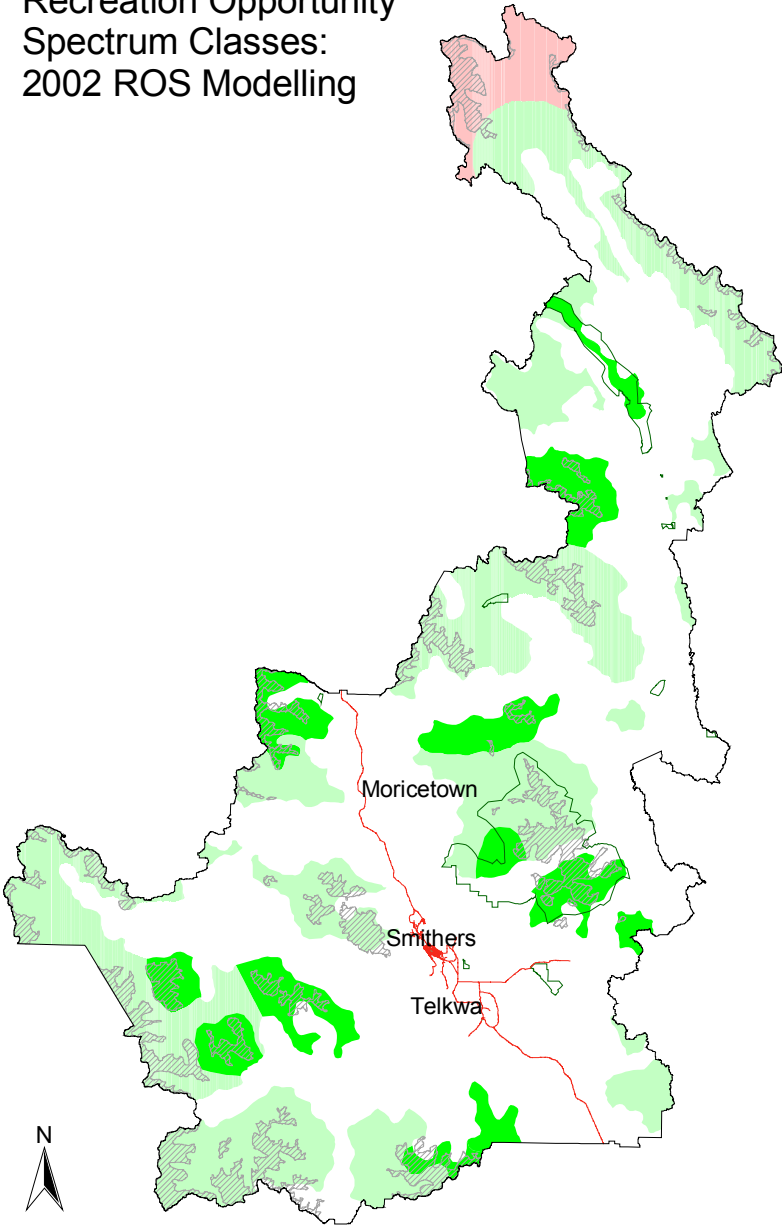
Year	ROS Class	Area	% of Total TSA area	Sum of %, P, SPNM and SPM
1983	Primitive	82,867	11	48
	Semi-Primitive, Non-Motorized	260,332	34	
	Semi-Primitive, Motorized	25,818	3	
2002	Primitive	20,427	3	44
	Semi-Primitive, Non-Motorized	238,351	31	
	Semi-Primitive, Motorized	74,025	10	

Figure 39 – ROS Comparison: 1983 versus 2002

Recreation Opportunity
Spectrum Classes:
1983 Recreation Inventory



Recreation Opportunity
Spectrum Classes:
2002 ROS Modelling



The table and figure highlight a loss in Primitive ROS, and a trend towards loss of area in the first three, most primitive ROS classes. Thus the potential to experience a wilderness or backcountry setting has gradually decreased over time as a result of increased access development.

The LRMP did not target a proportion of the TSA it is desirable to keep in a wilderness or backcountry setting. It is clear that road development is required to access timber, mineral and range resources, and recreational destinations, and a loss of primitive settings is inherent with development. Recreational resource users concerned with loss of the more primitive ROS categories are offset by others that appreciate increased access to recreational destinations.

However, the MOF recognizes that wilderness areas have a value in themselves regardless of the interests of user groups. Proposed actions to maintain a cross-section of lakes in a primitive or semi-primitive setting (see Indicator 3 – Wilderness Lakes) partly address this issue.

8.3.3 Recommendations

MSRM to develop a target for maintaining primitive and semi-primitive ROS, which would include ROS “budget” options (e.g. allowing ROS buy-back to a more primitive state through road rehabilitation).

8.3.4 Data Sources:

- ROS from 1983 Recreation Inventory (carried on the 1997 FC1 “f_rec” layer - (Northwest Data Centre, Bulkley District dataset)
- 1999 update FC1 road network, supplemented with Bulkley BCTS Road ledger (2002 update) GPS’d roads and additional new roads identified in PIR’s 2000-2009 Forest Development Plan.
- RAMP trails (trail designations were considered in ROS selection for given areas)
- New Parks coverage
- Alpine BEC zone (using TBEC)

8.4 Access Indicator 3. Wilderness Lakes¹⁸

8.4.1 Measure:

Number/location of candidate “wilderness lakes”, as defined by the Bulkley LRMP and further qualified in the draft Bulkley TSA Strategic Recreation Study (Harris, 2001).

8.4.2 Background:

The LRMP identified the need to retain lakes (i.e. “wilderness lakes”) in primitive or semi-primitive settings based on Resource Management Zone objectives, biophysical attributes and the Lake Classification Guidebook.

8.4.3 Results and Discussion:

Table 16 provides details of candidate wilderness lakes, and Figure 40 shows their location. Candidate wilderness lakes (28 total) were selected from approximately 309 remote lakes after a number of WLAP and MOF-led technical processes that considered a combination of evaluation criteria (some given more weighting than others in the final selection process):

- lake is more than 1 km from a road, with foot trail access longer than 2 km or no trail
- lake exceeds 10 hectares in size
- lake is within a primitive or semi-primitive Recreation Opportunity Spectrum class, according to Bulkley’s recreation inventories
- lake is rated in Bulkley recreation inventories as moderate or higher value for:
 - provision of primitive angling opportunities
 - wilderness recreation opportunities sought after by local residents and adventure tourists including hiking, wildlife viewing, scenic viewing, and undisturbed natural settings
- lake has a moderate or higher Attractiveness Rating based on the Harris (2001) system that considers diversity of physical features, range of possible recreation opportunities, existing facilities, and ease of access.
- lake has known recreation opportunities based on discussions with users and Harris’ personal knowledge
- lake has significant wildlife viewing or fishing values, or bears sensitive fish stocks, based on lake inventory reports and WLAP technical advice. See Bulkley LRMP Higher Level Plan

The 28 candidates resulting from the above selection process appear to be a sufficient cross-section of valuable wilderness lakes to address the LRMP objective. Remaining remote lakes are subject to the protection currently provided through legislation (i.e. lake-shore harvesting buffers) and in many cases LRMP zonation, which is deemed adequate.

The intent is that designated wilderness lakes be subject to future Landscape Unit Plan forest management provisions focused on maintaining their wilderness setting:

- no new road access, snow roads, or trails within 1 km
- permanent deactivation/revegetation of approved or existing roads upon completion of tree planting.
- manage to a retention visual quality objective, using the lake centre as a viewpoint.

Current forest management practices (i.e. adherence to Operational and Site Planning Regulation lakeshore management area specifications; protection through LRMP zones) are adequate to

¹⁸ Note that there are no official wilderness lakes to date in Bulkley TSA.

maintain the wilderness setting for most of the listed lakes; exceptions are noted in Table 16. Future mineral exploration activities also have the potential to disturb wilderness settings.

Table 16 – Candidate Wilderness Lakes

Lake Name	BCGS mapsheet	<i>Location (Lat/Long)</i>	<i>Wilderness setting maintained by:</i>
<i>Bud</i>	93L 082	54° 50' 49"; 127° 39' 01"	Partly in CE. Also, pothole lake, not visible THLB
<i>Cerber</i>	93L 082	54° 50' 26"; 127° 36' 47"	Pothole lake, not visible THLB
<u>Coppermine</u>	93L 057	54° 33' 34"; 126° 43' 14"	Part in CE, part unprotected
Farewell	93L 057	54° 36' 06"; 126° 38' 46"	CE
North Farewell	93L 067	54° 36' 56"; 126° 39' 12"	CE
Hilary	93M 085	55° 50' 23"; 127° 08' 17"	SMZ1
<u>McQuarrie</u>	93L 057	54° 34' 32"; 126° 40' 27"	CE
<i>Mooseskin Johnny</i>	93L 044	54° 28' 09"; 127° 21' 18"	Not protected
<i>Netalzul Meadow Lake</i>	93M 025	55° 14' 42"; 127° 03' 24"	CE
North	93L 057	54° 34' 01"; 126° 42' 23"	CE
South	93L 057	54° 33' 43"; 126° 42' 23"	CE
North Mulwain	103I 100	54° 54' 05"; 128° 05' 43"	CE
Onerka	93M 096	55° 58' 32"; 126° 59' 42"	SMZ1
Silvern (north)	93L 084	54° 50' 33"; 127° 22' 39"	Well outside THLB
Silvern (south)	93L 084	54° 50' 10"; 127° 22' 57"	Well outside THLB
<u>Touhy</u>	93M 015	55° 11' 50"; 127° 04' 12"	CE
Elliot n/n ¹⁹	93L 043	54° 29' 02"; 127° 35' 50"	SMZ1
Two-Bridge Lakes (west)	93L 096	54° 57' 44"; 126° 58' 28"	Park
Two-Bridge Lakes (east)	93L 096	54° 57' 15"; 126° 55' 00"	Park
Little Joe Lakes (west)	93L 086	54° 52' 25"; 126° 50' 05"	Park
Four Lakes (west)	93L 086	54° 51' 23"; 126° 49' 28"	Park
<i>Netalzul Lake</i>	93M 025	55° 16' 51"; 127° 01' 34"	CE
<u>Nichyeskwa1 n/n</u>	93M 047	55° 24' 58"; 126° 47' 30"	CE
<u>Nichyeskwa2 n/n</u>	93M 045	55° 29' 47"; 127° 01' 35"	Not protected
Babine n/n	93M 057	55° 31' 08"; 126° 46' 25"	Park
<u>Mero1 n/n</u>	93M 075	55° 47' 56"; 127° 06' 19"	Not protected
Mero2 n/n	93M 085	55° 48' 24"; 127° 04' 14"	Well outside THLB
Onerka n/n	93M 095	55° 58' 34"; 127° 00' 17"	SMZ1

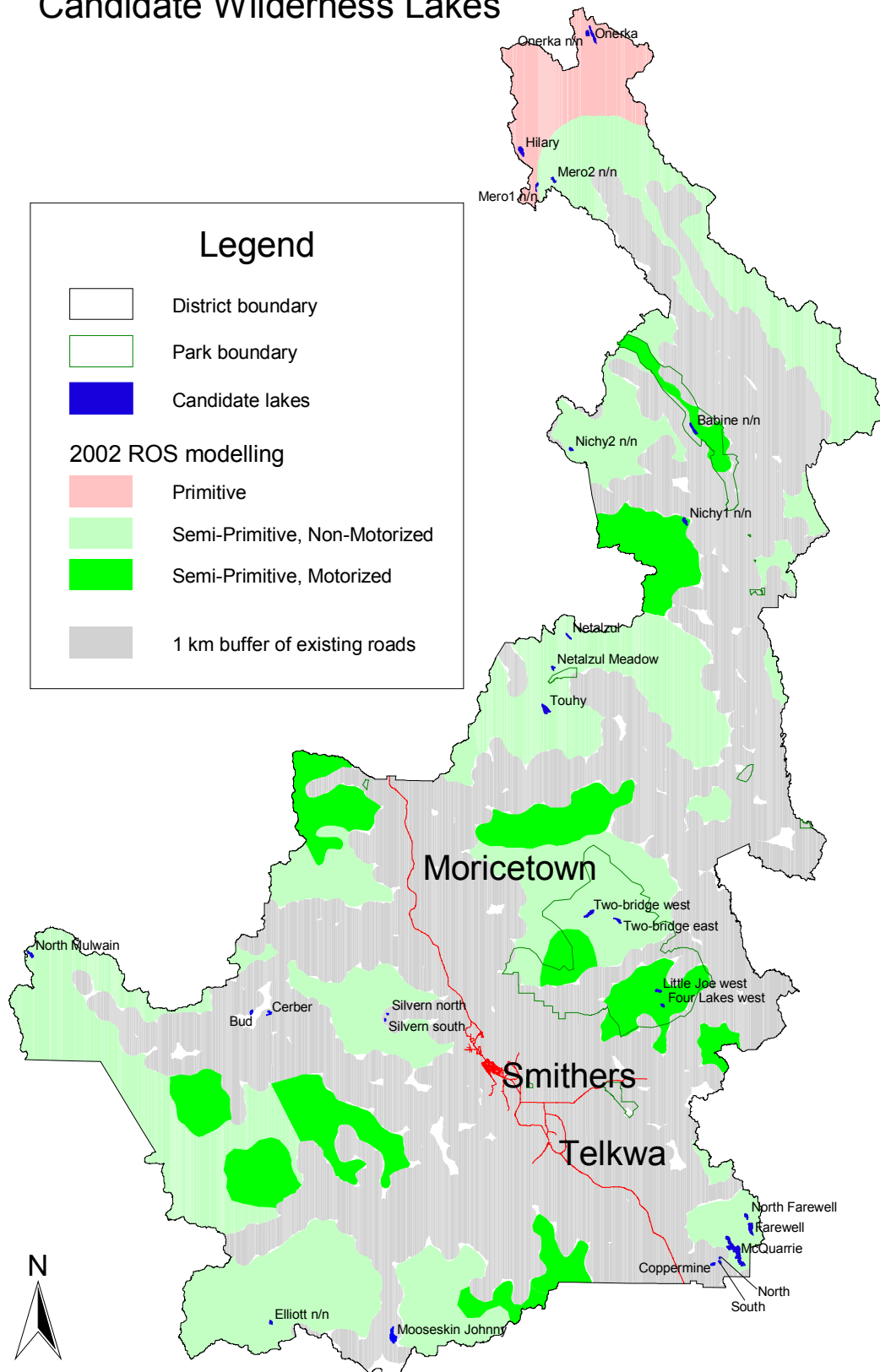
Italics = 360 degree photo mosaic available. A future weblink will be provided.

Bold = mosaic required

¹⁹ N/n = unnamed lake

Figure 40

Candidate Wilderness Lakes



8.4.4 Data Sources:

- Draft Wilderness Lakes proposal (July 2002)
- Draft Bulkley TSA Strategic Recreation Study (February 2001)
- Bulkley LRMP
- Trails level from Cultural Heritage - Archaeological Resource Inventory (CHARI)
- 1999 update forest cover (FC1) roads, supplemented with Bulkley BCTS Road ledger (2002 update) GPS'd roads and additional roads identified in PIR's 2000-2009 Forest Development Plan.
- Forest cover lakes from 1999 update FC1 (Northwest Data Centre, Bulkley District data set)

Personal communications:

- Rick Keim, WLAP
- Dave Harris, Hillcrest Recreation Consulting
- James Cuell, MSRM

8.5 Access Indicator 4. Circle Routes

8.5.1 Measure:

A map showing and naming key existing and potential circle routes, both within and between Districts. Baseline map for this report.

8.5.2 Results and Discussion:

The LRMP discouraged the development of within-District and between-District circle routes because of the potential for additional traffic and hunting pressures, and the greater difficulty in hunting regulation enforcement.

Table 17 presents attributes of existing and discontinued circle routes, and circle routes considered by licensees but withdrawn. Figure 41 shows their location.

Table 17 – Circle Routes

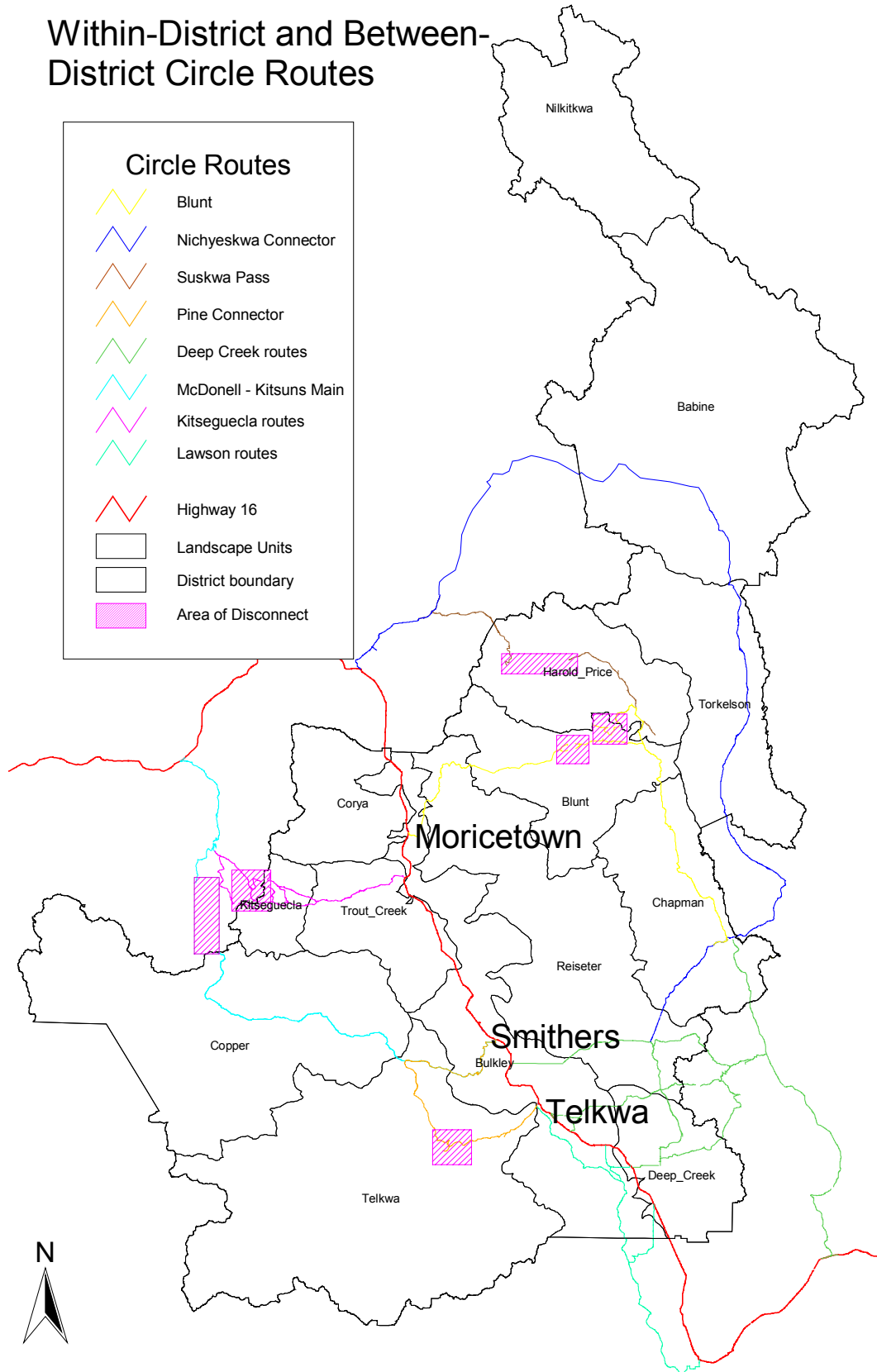
Circle Route	Within or Between-District	Status
Nichyeskwa Connector	Between Kispiox and Bulkley Districts	Current, 2WD accessible, gated
Blunt	Within District	Considered in plans but withdrawn
Suskwa Pass	Between Kispiox and Bulkley Districts	Considered in plans but withdrawn
Pine Connector	Within District	Discontinued, inaccessible
Deep Creek routes	Between Bulkley and Morice Districts	Current, 4WD accessible, connector not maintained
McDonnell – Kitsuns Main	Between Kispiox and Bulkley Districts	Considered in plans but withdrawn.
Kitsequecla routes	Between Kispiox and Bulkley Districts	Considered in plans but withdrawn.
Lawson routes	Between Bulkley and Morice Districts	Current, 2WD accessible

8.5.3 Data Source:

- 1999 update forest cover (FC1) roads, supplemented with Bulkley BCTS Road ledger (2002 update) GPS'd roads and additional roads identified in PIR's 2000-2009 Forest Development Plan.

Figure 41

Within-District and Between-District Circle Routes



8.6 Access Indicator 5. Access Development in Sensitive Terrain

8.6.1 Measure - length of roads and summer motorized trails built in alpine, alpine forest, wetlands, and meadows.

8.6.2 Results and Discussion

The LRMP discouraged access development within sensitive areas such as those listed above because they may support slow-growing plants that are very sensitive to disturbance, or have soils which can be easily damaged or eroded. Access development has historically enabled off-trail use by ATV's, mountain bikes and horses which can further damage these highly sensitive areas. It can be noted that no access roads have been built in sensitive terrain that would enable off-trail use, since the introduction of the Forest Practices Code in 1995.

Table 18 provides baseline data of the length of current (2002) access infrastructure in sensitive areas. Figure 42 shows locations, with a 1km buffer applied to show potential extent of off-road use in sensitive areas.

Table 18 – Length of Access Infrastructure Within Sensitive Terrain

Sensitive Area Type	Area of Type (ha)	Pre-1995 Road Length (km)	1995-2002 Road Length (km)	Pre-1995 Trail Length (km)	1995-2002 Trail Length (km)	Total by Type (km)
Alpine	114,965	42		34		76²⁰
Alpine Forest	25,857	23		14		37³
Wetland	6,982	4		3		7
Meadow	8,492	1		5		6
Total:	156,296	70		56		126

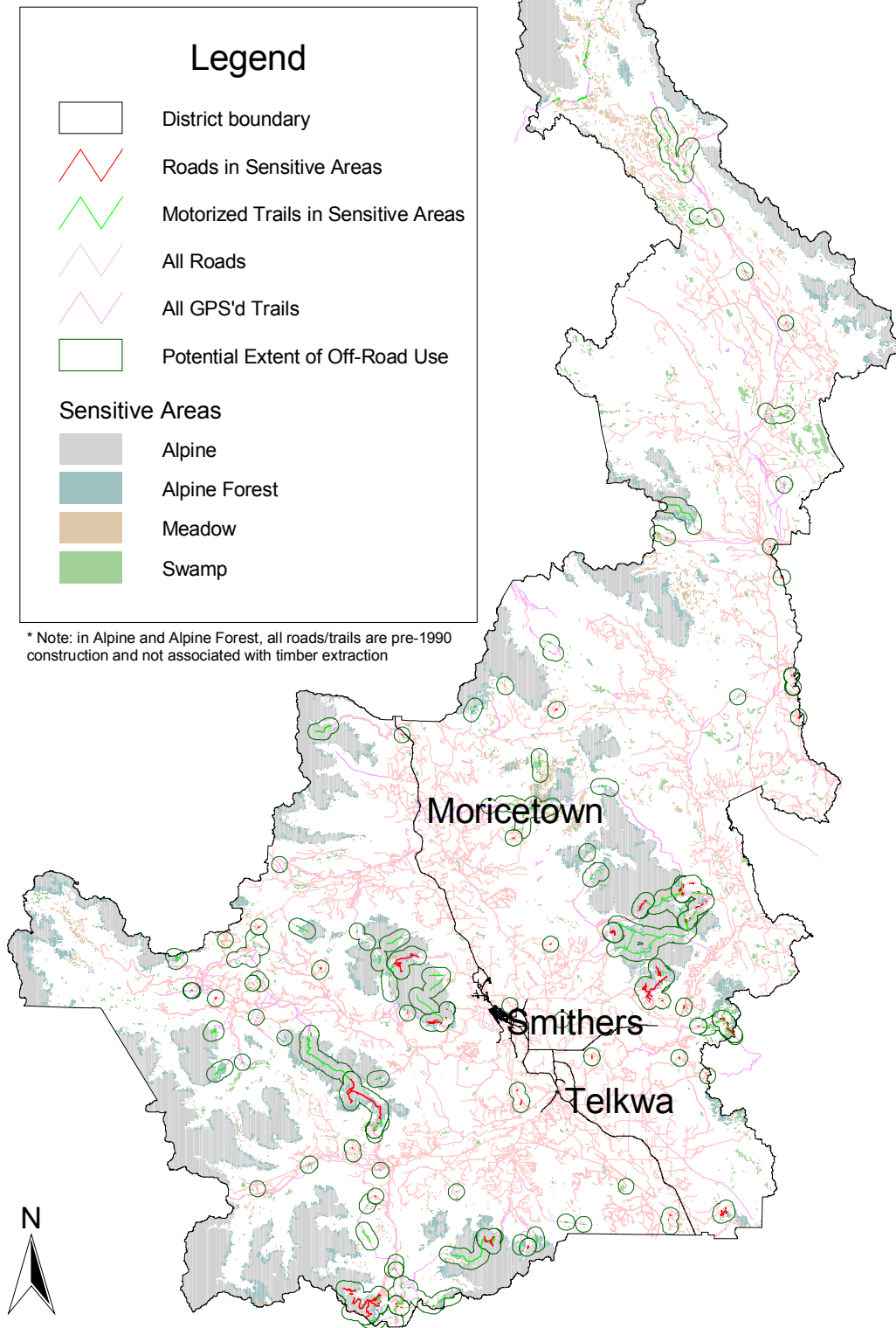
8.6.3 Data Sources:

- 1999 update forest cover (FC1) roads, supplemented with Bulkley BCTS Road ledger (2002 update) GPS'd roads and additional roads identified in PIR's 2000-2009 Forest Development Plan.
- Designated trails from the 1997 Bulkley TSA Recreation Access Management Plan (RAMP)
- 1999 update FC1 (Northwest Data Centre, Bulkley District dataset) to isolate sensitive terrain.

²⁰ None of this total is the result of forestry roads. Most is from pre-1990 mining access roads.

Figure 42

Motorized Access in Sensitive Terrain



8.7 Recreation Access Indicator 6. Areas Designated as per a Recreational Access Management Plan

8.7.1 Measure: progress towards designation of important recreational areas for motorized or non-motorized use.

8.7.2 Background:

The Bulkley LRMP directed the completion of a strategic Recreational Access Management Plan (RAMP) to manage recreational access while minimizing recreation-related disturbance to other resource values (e.g. wildlife). This process was also intended to resolve conflicts between off-road vehicle users and back-country skiers by designating certain areas for motorized or non-motorized use.

8.7.3 Results and Discussion:

The Bulkley RAMP process was convened in 1996 to designate controversial recreational areas for motorized or non-motorized recreational use. Consensus agreement resulted in designations for most areas (Figure 43). However, several areas were unresolved, or were scheduled to be resolved through a future process (i.e. through Landscape Unit Plans – LUP's). Their status is discussed in Table 19.

Table 19 – Status of RAMP “Unresolved (UR)” and “Future Process (FP)” Areas

Season	Category	Area	Current Status
Summer	FP	Upper Nilkitkwa (Sicintine Range, North and South Bait Range, Kotsine Mtn)	Remains undesignated. However, now in an SMZ1 where industrial timber extraction is not permitted. Wilderness recreation opportunities will be maintained.
		Driftwood-Reiseter Extension	Now in Babine Mountains Park. Subject to Park Master Plan.
		Serb Creek (Caribou Mountain)	Remains undesignated. However, contained in a SMZ2. LUP directs “Restrict non-industrial motorized access using access control points” and “maintain current access to Caribou Mountain (across Copper River to Serb Creek)”. So, de facto summer/winter motorized but restricted access.
		Scallion Creek	Remains undesignated. An access control point was established (at Telkwa River rather than below Scallion Creek) to restrict motorized traffic in the Mooseskin Johnny corridor. Telkwa Caribou Herd Recovery Plan (1997) endorses a voluntary winter/summer non-motorized designation in this area.
		Howson Creek Road	LRMP zoned this area SMZ1. Telkwa Caribou Herd Recovery Plan (1997) endorses a voluntary winter/summer non-motorized designation. Still not formally designated.
		Mooseskin Johnny Lake Trail	LRMP designated this area SM2 to protect caribou habitat and maintain the existing commercial backcountry tourism operation. Access control point established at Telkwa River. Still not formally designated.
		Hankin Plateau and Hunter’s Basin	Telkwa Caribou Herd Recovery Plan has a voluntary summer/winter no access designation. Revised July 2000 to non-motorized between July 15-Sept 15; no access outside those dates. The LRMP zoned this area SMZ1. Still not formally designated.

Winter	UR	Seaton/Blunt Basins	LRMP directs 'prepare a plan to address existing and potential activities among recreational users'. Still unresolved.
		Harold Price Meadows	Designation resolved through Jan 1, 1999 Harold Price Recreation Area Winter Management Strategy. Meadow Creek Access – undesignated. Mead Creek Access – non-motorized Blunt Access – motorized The Cabin and Lower Meadows – non-motorized.
		Hudson Bay Mountain Prairie/Crater Lake, The Peak	Oct. 6, 1998 letter to MOF from Nine Mile Snowmobile Club agrees to winter non-motorized designation. Area has signs indicating winter and summer non-motorized designation. No change as yet to RAMP, but considered resolved. Not part of Ski Smithers Controlled Recreation Area Agreement.
Winter	FP	Upper Nilkitkwa River (Sicintine Range, Bait Range North, Kotsine Mountain)	See Summer info.
		Call Lake	Now a Provincial Park. Subject to Park Management Plan
		Serb Creek (Caribou Mountain)	See Summer info
		Scallon Creek	See Summer info
		Starr Creek	Telkwa Caribou Herd Recovery Plan has a voluntary winter/summer non-motorized designation. Still not formally designated.
		Hunter's Basin and Hankin Plateau	See Summer info
		Driftwood-Reiseter Extension	See Summer info

8.7.4 Data source:

Bulkley Recreational Access Management Plan (July 25, 1997). Ministry of Forests.

Draft Bulkley TSA Strategic Recreation Study (October 2000). Hillcrest Recreation Consulting Inc.

Harold Price Recreation Area Winter Management Strategy (January 1, 1999)

Figure 43

Recreational Access Management Plan (RAMP) Motorized Roads/Trails and Areas

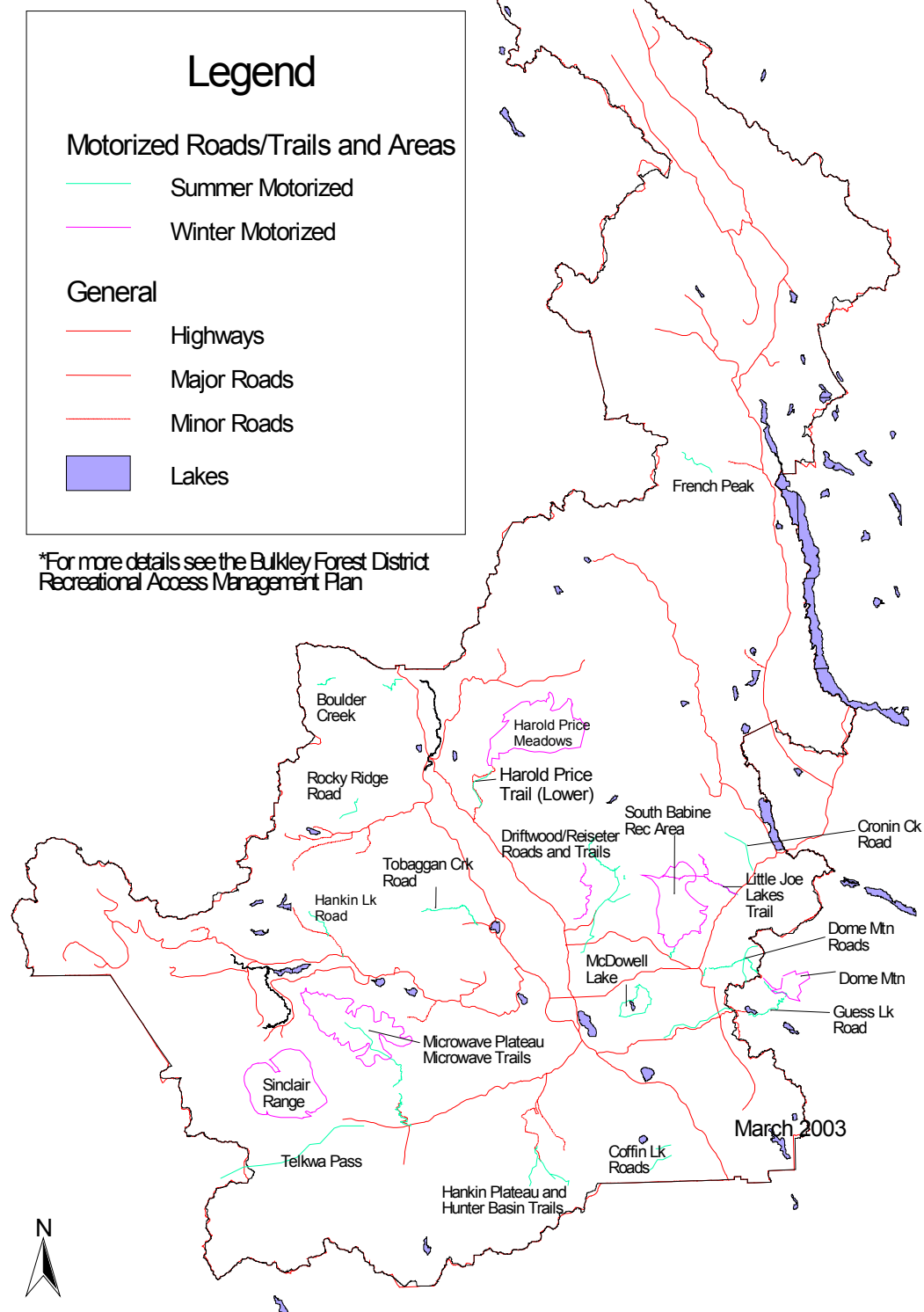
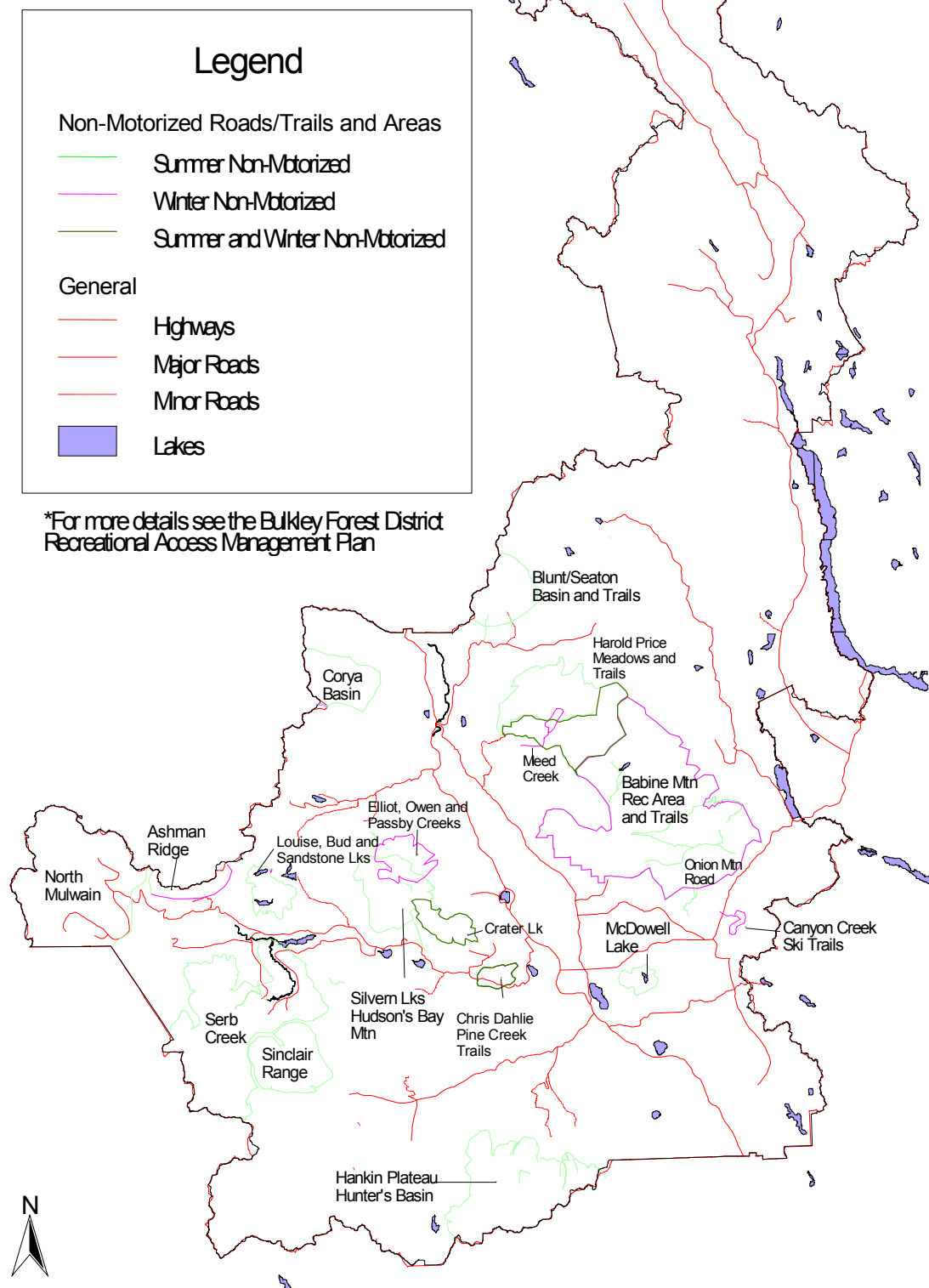


Figure 44

Recreational Access Management Plan (RAMP) Non-Motorized Roads/Trails and Areas



8.8 Recreation Access Indicator 7. Strategic use of Access Control to Minimize Human Impact on Fish, Wildlife, and Other Environmental Values

8.8.1 Measure: Efficacy of Access Control

8.8.2 Results and Discussion:

The LRMP identified several access-sensitive areas. Common protection measures for these areas include:

- no permanent access allowed
- establishing gates to facilitate restricted or seasonal access
- establishing alternative barriers to access (e.g. removing bridges; placing rock piles; deactivating roads upon completion of activities) to facilitate a more permanent access restriction

Table 20 lists access-sensitive areas and describes access control measures taken to protect their values; Figure 45 shows their location.

Table 20 – Access Sensitive Areas

Access-Sensitive Area	LUP provisions to manage sensitivity	Licensees in compliance
Grizzly – High value habitat	No permanent access within 150m of identified habitats	Generally yes – in addition, access control points are partially provided by Gates #2, 3 and 4 (Table 21). Several incidences of vandalism have occurred to Gate #3.
Grizzly – Moderate value habitat	2-pass harvest system with quick first pass followed by half a rotation of sustained inactivity. Secondary roads deactivated <5 years after harvest	Yes.
Grizzly – Nichyeskwa North management unit	Access control point to restrict access to industrial use only, from May 1 to Nov 1.	Yes – access control provided by Gate #3.
Grizzly – Nichyeskwa South management unit	Winter harvest only/prompt deactivation strategy	Yes.
Grizzly – Boucher Creek Wetlands management unit	Access control point to restrict access to industrial use only, from May 1 to Nov 1. 2-pass system with quick first pass harvest entry followed by half a rotation of sustained inactivity. Secondary roads deactivated <5 years after harvest	Yes – access control provided by Gate #2. In compliance with harvest and road deactivation provisions.
Goat Habitat	Access restricted within 1 km of habitat by deactivating roads, establishing access control points or constructing only temporary roads.	All three access control strategies implemented. Access control points include Gates #1, #5 and #6.

Caribou – Key Forested Habitat	4x4 access controlled by removing bridges or culvert at strategic locations. Snow machine/ATV access limited by maintaining treed barriers between roads, cut blocks and subalpine.	Yes.
Caribou – ESSF	As above.	Yes.
Caribou – Mooseskin Johnny Lake corridor	Access control point to restrict motorized traffic	Yes – Gate #11.
Copper River angling	Access restricted by using a deactivation strategy, access control point or temporary roads.	Partly. There are three points of access (McDonell South, Copper South and Dennis West FSR's). McDonell South bridge has a removable section (generally kept in place). Copper South bridge has no access control. Dennis West bridge has been pulled.
Kitseguecla River angling	As above.	Two of the three access control strategies implemented. The one crossing has no access control.
Babine River (west, south, east) SMZ2	As above. Also, temporary access maintained at least 300 metres from the wilderness zone boundary.	All three access control strategies implemented. Gate #3 provides an access control point for Babine River West.
Mulwain Creek SMZ2	Strategic placement of a gate to limit access to the Seven Sisters Protected Area.	Yes – Gate #8.
Serb Creek SMZ2	Strategic placement of gates to limit grizzly bear/non-industrial traffic interaction.	No development in this area as yet. Gates #9 and #10 are proposed to restrict access.
Reiseter Creek SMZ2	Per CRB direction, installation of a gate to minimize impacts on wildlife and to restrict access to the Babine Mountains Provincial Park.	Yes – Gate #6.
Babine Mountains Park	Maintain hiking trail access by protecting trails	Yes – trails are protected in part by gates (e.g. Gates #5 and #6), and by park status.

Gates²¹ have been selected to illustrate an effective, flexible means of access control. Their strategic placement enables harvest and road building to occur while at the same time protecting important wildlife, non-motorized, and environmental values. Table 21 lists existing gates on forestry roads and their current schedules; Figure 45 shows their location.

²¹ The Bulkley District Gate Lock Procedure is available for download from the Skeena-Stikine Forest District FTP site (http://www.for.gov.bc.ca/ftp/dss/external/publish/gate_lock_2.doc)

Table 21 – Gates

Number ¹	Location	Approximate Schedule	Value
1	22 km on 480 Road	Operational ²	Goats; Grizzly
2	1 km 465 Road	Closed all year round for the foreseeable future.	Grizzly
3	2 km 456 Road	Closed May 1 to Nov 1.	Grizzly
4	455 Road at District Boundary (Nichyeskwa Connector)	Closed in summer.	Grizzly
5	~2 km 314 Road	Operational.	Babine Mt. Park; Goats
6	~9 km 9000 Road	Operational; planned to be closed year round starting Fall of 2003.	Babine Mt. Park; Goats
7	54 km McDonnell FSR	Operational.	Seven Sisters Park
8	16 km Dennis West FSR	Proposed. Operations are planned several years in future.	Serb Creek SMZ2
9	~2 km Caribou Creek FSR	Proposed. Operations are planned several years in future.	Serb Creek SmZ2
10	0 km 188 Road (bridge for Telkwa River)	Operational.	Caribou

¹Several Woodlot licensees have installed gates on their woodlots to protect their logging equipment. These are not listed.

²Gates classified as “Operational” are **normally closed**, except when forestry operations are taking place. That is generally in the winter months for harvesting and the late spring for reforestation, and possibly in the summer for hauling of previously decked logs or road building.

In summary, there are 16 access-sensitive area types identified within the Bulkley LRMP, 11 of which are fully or partially protected using gates. The MOF reviews access management plans submitted by licensees to ensure provisions to protect values (Table 20) are observed: licensees are in general compliance with these provisions

8.8.3 Data Sources:

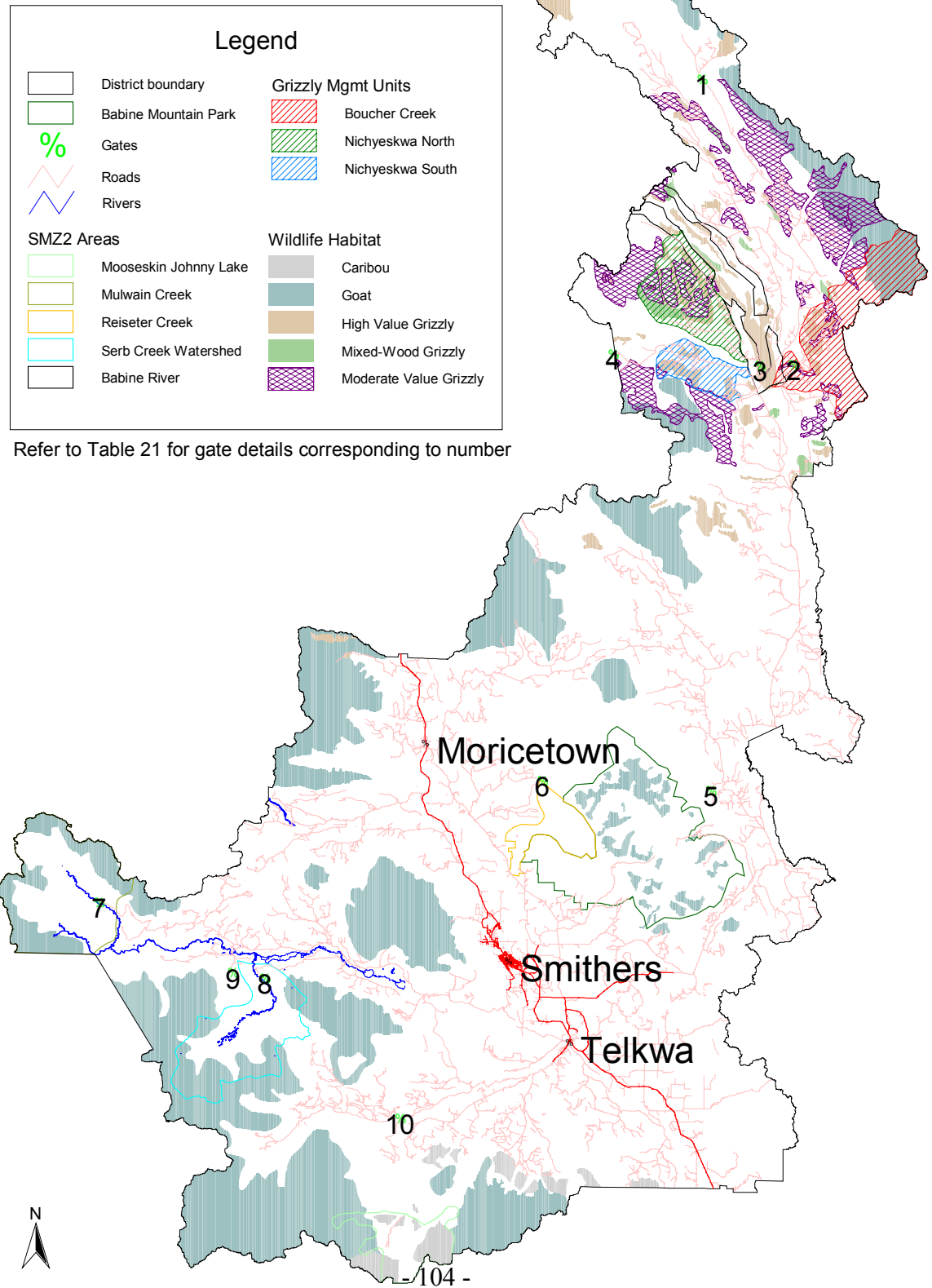
Bulkley District Gate Lock Procedure (draft, July 30, 2003). Ministry of Forests.

Bulkley LRMP (March 1998)

Bulkley Landscape Unit Plans (September 1999)

Figure 45

Access-Sensitive Areas; Gates



8.9 Recreation Access Indicator 8. Maintaining Road Access to Existing Recreational Site and Trails

8.9.1 Measure:

Number of instances where access has been maintained to existing recreational sites and trailheads (as identified by Bulkley LUP's) versus total number of important sites/trails.

8.9.2 Background:

There was concern that roads to important Recreation Sites and trailheads had potential to be deactivated by licensees, as a consequence of addressing constraints for access-sensitive areas (see Recreation Access Indicator 7) and deactivation activities to relieve road permit obligations.

The Bulkley LRMP directed that agencies, affected tenure holders and local user groups assist in managing existing and new recreational sites and trails. LUP's direct maintenance of "reasonable opportunity for access", which means ensuring the degree of deactivation permits two wheel drive access to these recreational destinations.

8.9.3 Results and Discussion:

Table 22 lists known trails identified during the Bulkley RAMP process, and Table 23 lists existing forest service recreational sites. Figure 23 shows their location. The goal for this value is for 100% of recreation sites/known trails to remain accessible. To date this goal has been achieved.

8.9.4 Data Sources:

Bulkley LRMP

Bulkley LUP's

Bulkley Forest District Recreation Map

Table 22 – Known Trails

#	Trail Name	Accessed off	#	Trail Name (cont'd)	Accessed off
1	Twin Falls to Viewpoint	Crown rd ²²	30	Corya Creek	Public rd
2	Glacier Gulch	Crown rd	31	Boulder Creek Road	Public rd
3	Prairie/Crater Lk, Hudson Bay Pk	Public rd ²³	32	Seaton Ridge	Crown rd
4	Chris Dahlie/Pine Ck ski trails	Public rd	33	Seaton Basin	Crown rd
5	Community Forest nature trail	Public rd	34	Moricetown-Cronin	Crown rd
6	Simpson Creek Road	Public rd	35	Harold Price – Blunt Ck. Route (snowmachine)	Crown rd
7	Toboggan Ck Rd – Silvern Lks	Public rd	36	Harold Price – Meed Ck. Route	Crown rd
8	Silvern Lakes/ Duthie Mine	Crown rd	37	Fort Babine	Public rd
9	Elliot Creek	Public rd	38	McDowell Lake	Public rd
10	Passby Creek	Crown rd	39	Call Lake	Public rd
11	Caribou Mtn South	Crown rd	40	Malkow Lookout	Public rd
12	Caribou Mtn North	Crown rd	41	Smithers Perimeter	Public rd
13	McDonell lake	Crown rd	42	Telkwa trails	Public rd
14	Dennis Lake/Mt. Leach	Crown rd	43	Duck Wing Lake	Crown rd
15	Louise /Bud/Sandstone	Crown rd	44	Lyon Creek	Non-status rd (Park)
16	Hankin Lookout	Crown rd	45	Harvey Mtn	Non-status rd (Park)
17	Ashman Ridge	Crown rd	46	McCabe	Non-status rd (Park)
18	Microwave Road/Winfield Ck.	Crown rd	47	Silver King Basin	Non-status rd (Park)
19	Hunter Basin Road	Crown rd	48	Two Bridge Lakes/Grassy Mtn	Non-status rd (Park)
20	Webster Lake	Crown rd	49	Little Joe Lakes	Public rd
21	Hankin Plateau	Crown rd	50	Onion Mtn Road	Public rd
22	Camel Humps/Glaxis Creek	Crown rd	51	Cronin Ck Road/trail	Public rd
23	Howson Ck Rd/Mooseskin Johnny Lake	Crown rd	52	Higgins Ck Road/trail	Public rd (Park)
24	Dominion Basin	Crown rd	53	Canyon Ck ski trails	Public rd
25	Telkwa Pass Road	Crown rd	54	Guess Lake Road	Crown rd
26	Goathorn East	Crown rd	55	Dome Mtn	Public rd
27	Jack Mould Lake	Crown rd	56	French Peak	Non-status rd (Park)
29	Rocky Ridge Road	Public rd			

Table 23 – Forest Service Recreation Sites

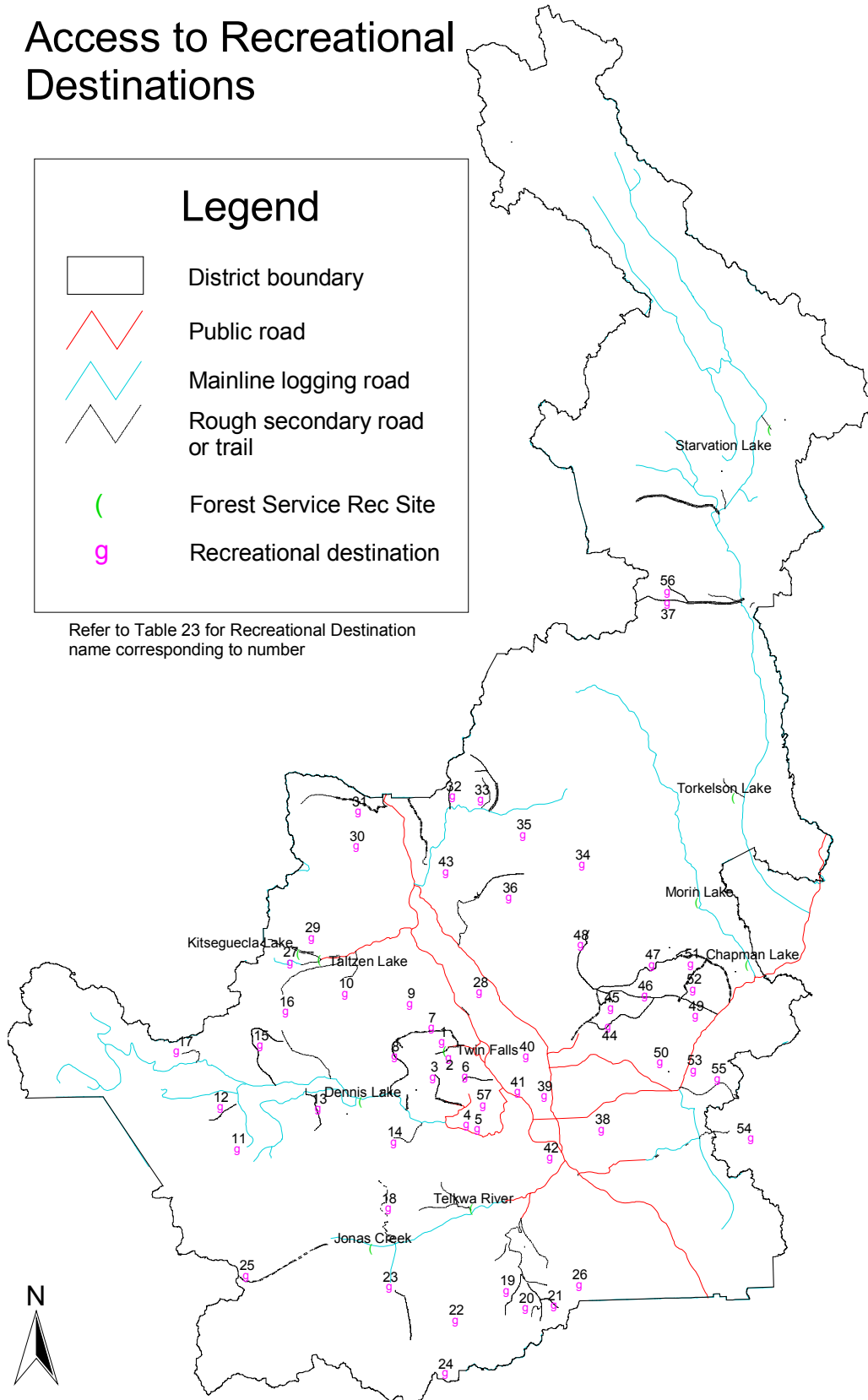
#	Name	Accessed off
1	Starvation Lake	Crown rd
2	Torkelson Lake	Crown rd
3	Kitseguecla Lake	Crown rd
4	Chapman Lake	Crown rd
5	Dennis Lake	Crown rd
6	Taltzen Lake	Public rd
7	Morin Lake	Crown rd
8	Telkwa River	Crown rd
9	Twin Falls	Crown rd
10	Jonas Creek	Crown rd

²² Crown Road is a road maintained by a resource developer.

²³ Public road is a road maintained by government.

Figure 46

Access to Recreational Destinations



9.0 Range

9.1 Interim Range Indicator 1. Use of Existing Grazing Tenure Area

9.1.1 Future Indicators:

Number of Animal Unit Months (AUM's) issued versus AUM carrying capacity, reported by Landscape Unit and by Range Unit.

9.1.2 Background:

The LRMP directed the:

- 1) development of target Animal Unit Months (AUM's) for the Bulkley Valley planning unit, and
- 2) evaluation of areas close to Bulkley Valley for range potential and range expansion.

Work towards completion of these activities continues. Additional to the Bulkley Valley planning unit, in 1998 Sinclair Creek and Goathorn Creek subunits were designated in their entirety as having high range potential. However, there remains the need to identify specific areas that are truly suitable for range expansion.

Potential range expansion areas on Crown land in Bulkley TSA include early seral plantations (which lose range potential through maturation), agricultural lease areas (which eventually convert to private land thus are lost to the Crown landbase) and deciduous seral types (which are available more permanently thus have high range potential). Work has been done to digitally map permanent deciduous seral sites and to derive a seral site series classification system.

An estimate of kg/ha forage production for Biogeoclimatic and new deciduous seral site series would make it possible to calculate a measure for total forage capability, thus enabling the completion of LRMP requirements. The derivation of this estimate remains a future priority. In the interim, the focus is placed on the forage capability of existing Bulkley grazing tenures.

9.1.3 Measure:

Animal Unit Months (AUM's) issued and allocated versus AUM's available, on existing grazing tenures.

9.1.4 Results and Discussion:

Figure 47 shows the location of range tenures currently administered by the Ministry of Forests, including grazing tenures. Table 24 provides baseline AUM allocation and estimated AUM availability figures for grazing tenures.

Table 24. – Baseline AUM Allocation, 2002

Maximum AUM's available on existing grazing tenures (estimated)	Total AUM Allocated (existing grazing tenures)	Total AUM issued (2002)	% use of maximum AUM's	% use of total AUM allocation
15000	7760	5260	35	68

An estimate of maximum AUM availability is provided because District Range doesn't automatically determine total forage capacity for a tenure area unless the tenure holder is planning to graze a number of livestock that may be approaching capacity. Of the estimated total forage capacity of 15,000 AUM's, only a portion is allocated.

AUM allocation is determined in reference to a range of criteria:

- if substantially less than the forage capacity of the grazing tenure, then AUM allocation is based on the actual number of head of livestock the licensee proposes to graze;
- if the number of head are close to or exceeding the forage capacity of the tenure, AUM allocation considers kg/ha forage measurements from permanent habitat monitoring plots. Only a portion (e.g. half to two-thirds) is considered available, to ensure that overgrazing is avoided;
- past licensee performance;
- input from the BV Cattlemen's Association.

The issued AUM figure is less than the total AUM allocation figure in Table 24 because some of the tenures are inactive.

In summary, data indicate relatively good use of total allocated AUM, and a use of maximum available AUM that is appropriate to AUM allocation criteria.

9.1.4 Data sources

- FTAS
- Levels 39, 45, 47 and 54 of BRANGE.DGN (located at L:\working\lim\data\exa\range\brange.dgn)
- Roads and major rivers, extracted from 1999 update forest cover (FC1) (Northwest Data Center, Bulkley District dataset)

Figure 47

Location of Range Tenure Areas

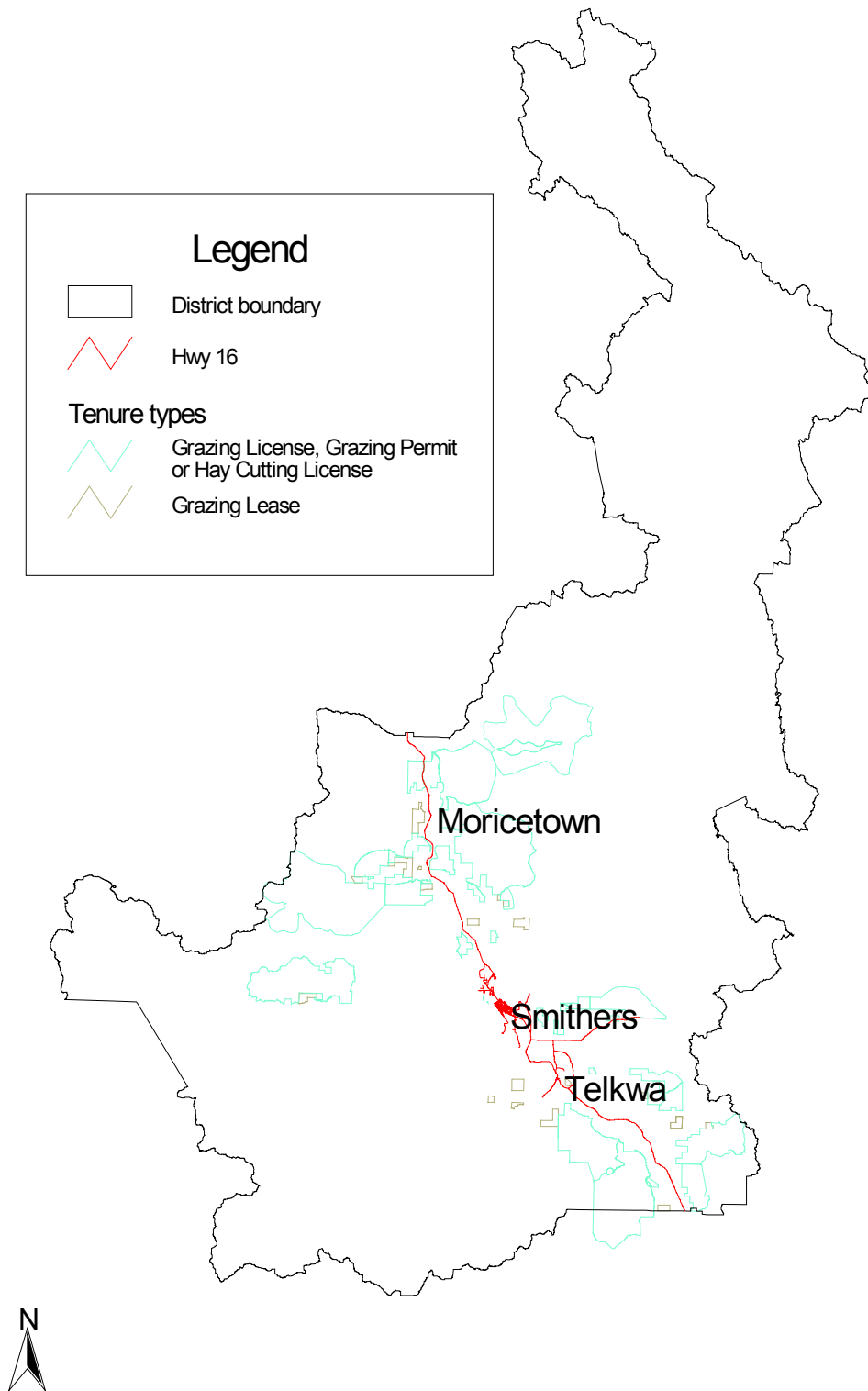
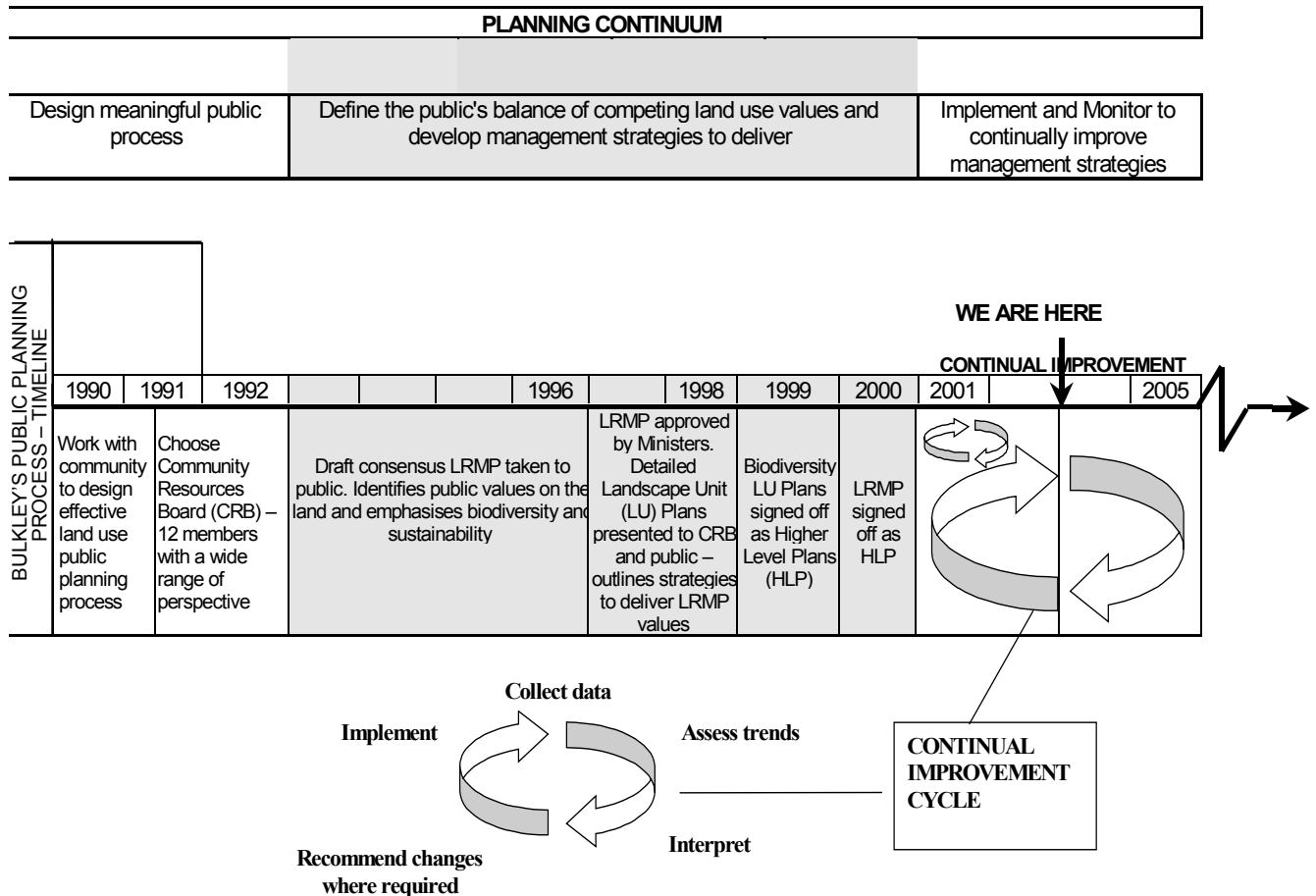


FIGURE 48: HISTORY OF PUBLIC PLANNING IN THE BULKLEY TSA



10.0 Summary

This report is the first attempt to complete the Continuous Improvement Cycle part of the Planning Continuum in the Bulkley (Figure 48). This step is intended to determine whether the management of the Bulkley forest is meeting society's objectives as laid out in the LRMP, and to recommend improvements that can be fed back into management decisions. Table 25 is a State of the Forest Report Card, which provides a concise statement on the current status of each indicator with reference to achieving its explicit or subjective measures. Those measures are summarized in Appendix 1.

Always vying for 100%, recommendations that would increase the achievement rankings for each value have been summarized in Table 26, and responsibilities have been identified.

Another Report Card will be published in 5 years to determine whether our performance in achieving indicator targets has improved as a result of implementing this reports recommendations.

Table 25 - State of the Forest Report Card

			Indicator Achievement*			
Code	Value	Indicator	0	25	50	75
B1	Biodiversity	Ecosystem Representation	100%			
B2		Old Seral in Cores	No Target			
B3		Interior Forest in Cores	100%			
B4		Seral Stage Distribution	93%			
B5		Landscape Connectivity	81%			
B6		Patch Size Distribution	96%			
B7		Protection for Endangered Plant Communities	48%			
B8		Stand Structure	100%			
B9		Species composition	97%			
W1	Wildlife Habitat	Adherence to Forest mgt Objectives	99.9%			
SI	Watershed Integrity	Terrain Stability Mapping	92%			
S2		Overview Watershed Assessments	80%			
S3		Watershed Restoration	65%			
S4		Co-ordinated Water Quality Monitoring	25%			
T1a	Timber Management	Prompt Reforestation (reforested vs. denuded)	95%			
T1b		Prompt Reforestation (FG vs. denuded)	72%			
T2		Maintenance of Forest Health	90%			
T3		Sustained Flow of Timber	86%			
T4		Harvest the Profile	64%			
V1	Visual Quality	Visual Quality of Timber Harvesting	100%			
C1	Cultural Heritage	Management of Cultural Heritage Features	75%			
R1		Access to Facilitate Natural Resource Mgt. Extraction	84%			
R2		Recreational Access	90%			
R3		Wilderness Lakes	86%			
R4		Circle Routes	88%			
R5		Sensitive Terrain	84%			
R6a		Access per RAMP (summer)	90%			
R6b		Access per RAMP (winter)	79%			
R7		Impact on Fish, Wildlife & Other Env. Values	88%			
R8		Access to Recreational Sites/Trails	100%			
C1		Use of Existing Grazing Tenure Area	35%			

*Rationale for determining each Indicator Achievement is provided in Appendix 1

Table 26 – Summary of Recommendations, by Indicator

Value	Indicator	Recommendations
Biodiversity	Seral Stage Distribution	<p>MOF - Kitsequecla and Bulkley LU's lack old seral objectives. DM should consider Biodiversity Guidebook old seral "objectives" in FDP/FSP review. These "objectives" are not achieved in Bulkley ICHmc2, SBSdk, SBSmc2; Kitsequecla ESSFmc and ICHmc2.</p> <p>Licensees – shouldn't submit proposals for clearcut harvest in Trout Creek ICHmc1, mc2, Corya ICHmc2, Reiserter ICHmc1, mc2, and Deep Creek ESSFmc until seral stage objectives are met.</p> <p>MSRM – should amend the LUP for Deep Creek to include a recruitment objective for old seral.</p> <p>- should include old seral recruitment objectives in the future Kitsequecla and Bulkley LUP's.</p>
	Landscape Connectivity	<p>Licensees – shouldn't propose harvest in corridors identified in yellow and red on Figure 7 until mature forest objective is achieved</p>
	Patch Size Distribution	<p>Licensees</p> <ul style="list-style-type: none"> ▪ should avoid harvest in Trout Creek NDT3. Concentrate harvest in small and medium patches in NDT 1 and 2 within objective limits. ▪ Reiserter NDT3 – should withdraw certain proposed blocks and aggregate recently harvested medium patches into large patches. ▪ where one or more patch size type objectives are being met for a specific NDT, should target those patch size types for the NDT where objectives are not yet achieved.
	Protection for Endangered Plant Communities	<p>MSRM – should ensure any future adjustment of Core Ecosystem boundaries includes examples of under-represented plant communities</p> <ul style="list-style-type: none"> ▪ should revisit the PEM logic tables for SBSdk/06, SBSmc2/05 and ICHmc2/51 <p>Licensees – should use existing or potential rare and endangered plant community maps as a planning layer for FDP's/FSP's</p>
	Stand Structure	<p>MOF – develop mechanism for differentiating and tracking permanent and temporary reserve areas.</p>
Wildlife Habitat	Adherence to Forest mgt Objectives	<p>Licensees – should rationalize submission of new harvest proposals in high-value moose habitat in Blunt LU, and high-value grizzly bear habitat in Harold Price LU.</p> <p>MSRM/WLAP – consider development/establishment of formal habitat structure targets in high-value habitat types</p>

Table 26 – Continued

Watershed Integrity	Overview Watershed Assessments	<p>Licensees – should complete a watershed assessment procedure for Corya, John Brown, Toboggan and Fulton watersheds prior to submission of new harvest proposals.</p> <ul style="list-style-type: none"> ▪ should avoid harvest or conduct new assessments in watersheds where assessment triggers have been exceeded (Boucher, Nilkitkwa Lake, IR #5 Nilkitkwa, Heal, Five Mile)
	Co-ordinated Water Quality Monitoring	BARC – should develop a continuous and strategically focused monitoring system, to facilitate comparison of water quality attributes against the natural range of variability.
Timber Management	Harvest the Profile	MOF – maintain a marginal sawlog/pulp AAC as long as licensees consistently harvest in that partition type.
Visual Quality	Visual Quality of Timber Harvesting	MOF – provide (via weblink) panoramic photos of current views of visually sensitive areas as seen from LRMP viewpoints, to facilitate public judgement of whether VQO objectives are being achieved.
Cultural Heritage	Mgmt of Cultural Heritage Features	MOF – develop system to identify all known cultural heritage features, and track # features protected as a direct result of 1 st Nations consultation
Access	Recreational Access	MSRM – consider developing a semi-primitive and primitive ROS target
	Wilderness Lakes	MSRM – should amend LUP's to include objectives and strategies for Wilderness Lakes
	Access per RAMP	MSRM – should convene another RAMP process to deal with FP and UR areas
Range	Use of Existing Tenure Area	MOF/MSRM – develop kg/ha forage production estimates by site series

Appendix 1

Measures and Context for Stated Indicator Achievement in State of the Forest Report Card

B1 – at least some representation of all BEC variants within protected areas and Landscape Riparian Corridors

B2 - unclear if Old Seral in CE's is "representative", due to lack of BEC information.

B3 – intent was for "some areas with interior forest conditions", so indicator is 100% achieved.

B4 – progress measured by calculating proportion meeting LUP seral stage objectives targets on forested area basis.

B5 – proportion LC by total area that achieve mature forest objective of 70% greater than 80 years.

B6 – proportion less than or at patch size distribution targets (by NDT by LU) based on forested area.

B7 – calculation of [# known or PEM predicted rare and endangered plant communities with <10% representation in protected areas, SMZ1's and Core Ecosystems] / [all known or PEM-predicted rare and endangered plant communities within TSA].

B8 – progress towards achieving LUP WTP% targets by BEC variant. Stated here as 100% based on MOF data, with proviso that reserve area reported by MOF data systems is known to be a combination of permanent and temporary reserve, and target should be achieved by permanent reserve alone.

B9 - proportion (based on forested area) of BEC variants with a plantation species composition that is generally reflective of the natural composition in consideration of seral trends. CWHws2 and MHmm2 are the only problem variants that were identified.

W1 – proportion (based on forested area by LU) of wildlife habitat areas that achieve TSR2 habitat structure modelling parameters.

S1 – proportion of forested areas with slopes >60% that have been mapped for terrain stability or are contained within no-harvest areas.

S2 – proportion (based on #) of watersheds both requiring and having overview watershed assessment procedures.

S3 – proportion (based on #) of key priority watersheds where prescriptions and upslope works for watershed restoration activities are complete.

S4 – subjective measure of progress towards fully coordinated watershed-level and site-level water quality monitoring by agencies and licensees.

T1a – proportion of net opening area (as tracked by MOF systems) that has been satisfactorily reforested

T1b - proportion of net opening area (as tracked by MOF systems) that is free-growing.

T2 – subjective measure indicating likely success of District forest health programs at maintaining known forest pests at or below endemic levels.

T3 – average proportion of total AAC harvested by licensees from 1987-2002

T4 – average proportion of marginal sawlog/pulp AAC harvested by licensees from 1995-2000

V1 – proportion (based on #) of openings in VQO areas that meet VQO's

C1 – subjective measure of likely degree to which CH features are recognized and protected through adherence to District policies in site-level practices

R1 – proportion (based on THLB area) within 2 km of existing access thus considered “accessible”.

R2 – proportion (based on area) of 1983 ROS “P, SPNM and SPM” total area remaining in 2002.

R3 – proportion (based on #) of candidate “wilderness lakes” already protected from harvest as result of LRMP zonation or being outside of THLB.

R4 – proportion (based on #) of known within or between-District circle routes remaining disconnected.

R5 – proportion (based on total area) of mapped sensitive area types likely at less risk to damage by ATV’s, mountain bikes, or horses, based on their likelihood of staying within 1 km to either side of existing roads and trails.

R6a – proportion (based on #) of important summer recreational areas that have been designated for motorized or non-motorized use or are protected in Parks or SMZ1’s.

R6b – proportion (based on #) of important winter recreational areas that have been designated for motorized or non-motorized use or are protected in Parks or SMZ1’s.

R7 – proportion (based on #) of access-sensitive areas where access is being managed in complete adherence to LUP provisions.

R8 – proportion (based on #) of recreational sites and trailheads to known trails for which reasonable opportunity for access is being maintained.

C1 – proportion of maximum AUM’s available on existing grazing tenures that was issued in 2002.

Appendix 2 List of Participants

Bulkley Interagency Planning Team

Ministry Participants: Hubert Burger, FOR; Bob Copley, MSRM; James Cuell, MSRM; Lloyd Davies, FOR; Brian Fuhr, MSRM; Paul Giroux, WLAP; Johanna Pfalz, MSRM; Don Reid, MSRM; Anna Regnier, MSRM; Doug Steventon, FOR; Len Vanderstar, WLAP; Dave Wilford, FOR; Elizabeth Zweck, MSRM

Bulkley Valley Community Resources Board

Dean Daly, Alison Davis, Adrian de Groot, Steve Derby, Rosemary Fox, Jessica Hall, Dallas Kerr, Marty Kranabetter, Martina Namox, Terri O’Neill, Gary Quanstrom, Hans Smit

Appendix 3

Glossary

Allowable annual cut (AAC)	The rate of timber harvest permitted each year from a specified area of land, usually expressed as cubic metres of wood per year. The chief forester sets AACs for timber supply areas (TSA) and tree farm licences (TFLs) in accordance with Section 7 and/or Section 170 of the <i>Forest Act</i> . The district manager sets AACs for woodlot licences.
AT	Alpine Tundra
Biodiversity	The diversity of plants, animals and other living organisms in all their forms and levels of organization, including the diversity of genes, species and ecosystems, as well as the functional processes that link them.
Biogeoclimatic zones (BEC)	A system of ecological classification based primarily on climate, soils, and vegetation that divide the province into large geographic areas with broadly homogeneous climate and similar dominant tree species. Zones are further broken down into subzones (based on characteristic plant communities occurring on zonal sites) and variants (based on climatic variation within a subzone).
Blue-list	Sensitive or vulnerable species as identified by the Ministry of Water, Land and Air Protection. Blue-listed species are considered to be vulnerable and "at risk" but not yet endangered or threatened. Populations of these species may not be declining but their habitat or other requirements are such that they are sensitive to disturbance. The blue list also includes species that are generally suspected of being vulnerable, but for which information is too limited to allow designation in another category.
Core Ecosystems	Management zones identified for the express purpose of maintaining structural and functional features of old forest ecosystems. Zone includes Old Growth Management Areas (OGMAs) and TU 2 from the Babine LRUP.
CWH	Coastal Western Hemlock

Ecosystem	A functional unit consisting of all the living organisms (plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size, a log, pond, field, forest, or the earth's biosphere, but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation for example, forest ecosystem, old-growth ecosystem, or range ecosystem.
Ecosystem networks	Core Ecosystems and Landscape Riparian Corridors
ESSF	Engleman Spruce Sub-alpine Fir
ICH	Interior Cedar Hemlock
Land and Resource Management Plan (LRMP)	A strategic, multi-agency, integrated resource plan at the sub-regional level. It is based on the principles of enhanced public involvement, consideration of all resource values, consensus-based decision making, and resource sustainability.
Landscape	A watershed or series of similar and interacting watersheds, usually between 1,000 and 100,000 hectares.
Landscape connectivity	A qualitative term describing the degree to which late-successional ecosystems are linked to one another to form an interconnected network. The degree of interconnectedness and the characteristics of the linkages vary in natural landscapes based on topography and natural disturbance regime. Breaking of these linkages may result in fragmentation.
Landscape Corridors	Management zones that include riparian and linkage corridors which provide landscape connectivity
Landscape Level Planning	Planning undertaken to coordinate and integrate resource conservation and development activities, and to provide for the maintenance of biodiversity, in landscape units.
Landscape Units	Geographic units delineated on the basis of physiographic and/or ecological features, such as watersheds. They serve as a focal point for the coordinated management of a broad range of resource values, and are central to the management of landscape-level biodiversity. Design of ecosystem networks, visual resource management, and access management are examples of common activities of landscape-level planning.
MH	Mountain Hemlock
Monitoring	Ongoing assessment of how well the management objectives of the LRMP are being implemented. Effectiveness monitoring will assess how well the management objectives are meeting the goals or intent of the LRMP.

Protected Areas	Areas such as provincial parks, federal parks, wilderness areas, ecological reserves, and recreation areas that have protected designations according to federal or provincial statutes. Protected are land and freshwater or marine areas set aside to protect the province's diverse natural and cultural heritage.
Red-Listed Species	Candidates for legal designation by the Ministry of Water, Land and Air Protection as endangered or threatened
Resource Management Zones (RMZ)	A tool for implementing government's social, economic, and environmental objectives for land and resource use within the province. RMZs identify provincially significant resource values and provide overall direction for their management. The management direction must be compatible with the enhancement of the resource identified in the zone (e.g. Low intensity development to protect caribou habitat). Resource management zones are identified as a higher level plan in the BC Forest Practices Code Act.
Riparian area	Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes including both the area dominated by continuous high moisture content and the adjacent upland vegetation that exerts an influence on it.
SBS	Sub-Boreal Spruce
Scenic Area	Any visually sensitive area of scenic landscape identified through a visual landscape inventory or planning process carried out or approved by a district manager.
Seral (forest or stage)	Sequential stages in the development of plant communities (e.g. from young (or early seral) stage to old stage (or old seral)) that successively occupy a site and replace each other over time.
Stand Value	Is a complex analysis and is modeled based on the anticipated quality of timber stands and associated harvesting costs.
Sustainable	A state or process that can be maintained indefinitely. The principles of sustainability integrate three closely interlinked elements - the environment, the economy and the social system - into a system that can be maintained in a healthy state indefinitely.

Timber Supply Area (TSA)	An integrated resource management unit established in accordance with Section 6 of the <i>Forest Act</i> . TSAs were originally defined by an established pattern on wood flow from management units to the primary timber-using industries. They are the primary unit for allowable annual cut determinations.
Visual Landscape Inventory (VLI)	An inventory that identifies visible areas that have known or potential scenic value as seen from selected viewpoints, such as towns, parks, recreation sites and highway and river corridors. This province-wide inventory undertaken by the Ministry of Forests is designed to provide information on visual quality for planning including strategic planning (e.g. LRMPs) and operational planning (forest development plans). One of the components of a VLI are Recommended Visual Quality Objectives (VQOs).
Visual Quality Objectives (VQO)	A resource management objective established by the district manager or contained in a higher level plan that reflects the desired level of visual quality based on the physical characteristics and social concern for the area. Five categories of VQO are commonly used: preservation; retention; partial retention; modification and, maximum modification.
Watershed	An area of land that collects and discharges water into a single main stream through a series of smaller tributaries.
Wildlife Trees	Dead, decaying, deteriorating, or other designated trees that provide present or future habitat for the maintenance or enhancement of wildlife.