INTERIM WOOD SUPPLY PLAN
FOR
FOREST MANAGEMENT UNITS Y02, Y03 AND Y09
IN THE
KASKA YUKON TRADITIONAL TERRITORY

Prepared for

The Kaska Forest Resources Stewardship Council
and
Forest Management Branch, Yukon Territorial Government

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1.0 Introduction

With the signing of the *Memorandum of Understanding on Forest Stewardship for the Kaska Traditional Territory* (MOU) on July 29th, 2002, authority to pursue an interim wood supply in FMUs Y02, Y03 and Y09 was provided under Section 9.0. Subsequent to the signing of the MOU, the establishment of a Kaska Forest Resources Stewardship Council led to an *Interim Supply Recommendation* that was signed on February 3, 2003 and states:

- "*That interim supply, upon completion of the Forestry Economic Benefits Agreement and outstanding land steward information is collected and such consultations are appropriately included, be made available in one or all of three planning areas: East Hyland, West Rancheria, or the Fire Smart area immediately south of the community of Watson Lake*".

- "*That the interim supply plan will be for up to 128,000m^3 in Y02 and Y03 and may propose up to 3 years of supply at this level, unless otherwise modified in accordance with the Forestry Economic Benefits Agreement being signed".*

- *"That interim supply, upon completion of the Forestry Economic Benefits Agreement and outstanding land steward information is collected and such consultations are appropriately included, be made available in the vicinity of Ross River (Y09)".*

- *"That the levels for interim wood supply in the vicinity of Ross River not exceed 5000 m^3 over 3 years".*

This report outlines the potential for developing such interim wood supply in the above planning areas, using the same guiding principles for Forest Resources Management Plans as outlined in Section 3.0 of the aforementioned MOU. Those principles are as follows:

- *"The principles set out in the Canada Forest Accord, and the National Forest Strategy (1998-2003).*
- *"Forest stewardship requires an integrated and balanced approach in planning, management, policy and land tenure development".*

- "*Forest Resources management must include remedial measures and monitoring".*
- "*Annual Allowable Cut determinations and Timber Supply Analyses must be based upon the Forest Resources Management Plans developed under this agreement".*
- *"Proper Forest Resources management in the Kaska Traditional Territory requires that the traditional knowledge and experience of the Kaska people be integrated with that of the scientific community".*
- *"Kaska traditional land use must be considered and best efforts must be made to protect Heritage Sites".*
- *"Kaska should receive economic benefits from exploitation of forests in the Kaska Traditional Territory".*

Perhaps the key word that provides the best synopsis of these principles is **sustainability.** As stated on page 114 of *Yukon State of the Environment Report (1998):*

> *"The ultimate test of Yukon forest management decisions will be the long-term health of forest ecosystems and the continuation of a sustainable forest industry."*

To monitor progress toward sustainable forest management, the Canadian Council of Forest Ministers (CCFM) identified six broad criteria, namely:

1. *Conservation of biological diversity.*
2. *Maintenance and enhancement of forest ecosystem condition and productivity.*
3. *Conservation of soil and water resources.*
4. *Forest ecosystem contribution to global ecological cycles.*
5. *Multiple benefits to society.*
6. *Accepting society's responsibility for sustainable development.*

It is therefore incumbent on the forest planner - and a primary purpose of this report - to identify, at landscape level, the particular resource values to which these criteria will apply. Those values will then require a range of stand-level actions appropriate for each portion of the planning area: ie, "what kind of management are we going to do, and where on the landscape are we going to do it". The choice of appropriate management actions depends on correctly identifying the natural ecosystems that comprise the landscape, and emulating the natural processes that affect the temporal and spatial dynamics of those systems. Thus, the design of the plan is done at both the landscape level and at the level of individual sites, because when the plan is put into effect, the objectives for the landscape are physically implemented site by site.

The Kaska have long been an integral part of the Yukon's ecology and have been extracting resources from their traditional territory for centuries. While the scale of usage may change with the passage of time, the principle of sustainable use does not. The desired "multiple benefits to society" have to be obtained in ways that do not jeopardize the ability of the land to provide these benefits in perpetuity.

✻Note to Readers

Forest age and size of Plan area.

The usual duration of a Total Resource Plan or TRP is one full harvest cycle, based on the age at which most timber in the plan area reaches commercial maturity. Typically this is 80-120 years for a spruce/pine mixture in a continental climate at mid latitudes (50-60^{o}). Harvesting at different phases of the cycle is then planned according to the forest age-distribution and the age-related values of other resources such as wildlife habitat existing on the landscape. The aim is either to ensure that the initial state of the area is maintained throughout the cycle, or to arrive at some more desirable state by the cycle's end if initial conditions are judged to be unsatisfactory in some way. For these aims to be achieved, the various age-related values must either be distributed evenly throughout all parts of the plan area, regardless of its size, or the area must be large enough to allow the planning to vary at different times in different places.

In their present state, none of the areas covered by this plan are large enough to satisfy these aims. Small size and artificial boundaries have meant that each of the four *planning* units represents only a small part of the *ecological landscape* unit in which it sits. However, the mandate for this plan is merely to identify a three-year supply of harvestable wood without compromising the sustainability of either the future timber supply or the non-timber values that co-exist with it. With only a three-year timescale, the plan for each unit provides no more than a framework or starting point for a full-scale TRP. Options for the longer term still remain to be determined.

Basic principles

Section 2 lists the key principles of approach that have been applied to the present plan. Some of the ideas behind them are quite complex and could easily merit fuller description than this report provides. However, the purpose of Section 2 is simply to outline the basic concepts, not to debate their pros and cons. More complete discussion can be found in the forest management literature (see *References*).

Terminology

Several of the terms used in this report are also used in other jurisdictions and some of them have an official status there. They are adopted here solely for their descriptive usefulness, not to imply or promote an equivalent status in the Yukon Territory. A glossary of the principal terms is given at the end of the report.

1.1 Descriptions of the Planning Units

Four planning units are concerned. Three of these (Watson Lake, East Hyland, and West Rancheria) lie within the Liard Basin Ecoregion of the Boreal Cordillera Ecozone of the south-east Yukon. The fourth (Ross River) lies within the Yukon Plateau North Ecoregion.

The **Watson Lake** unit surrounds the community of that name and is mainly composed of glacio-fluvial terraces adjacent to the Liard River, and rounded morainal hills northeast of the town. Upland forest types are dominant, with some lowland areas along the river. Much of the unit is covered by various sub-regional plans, Timber Harvest Areas (THAs), and other types of alienation from total resource planning. Accordingly, in regard to the present plan, only small volumes of wood for local use could be identified within the unit despite the extent of potential working forest (see *Recommendations*, Sec. 7).

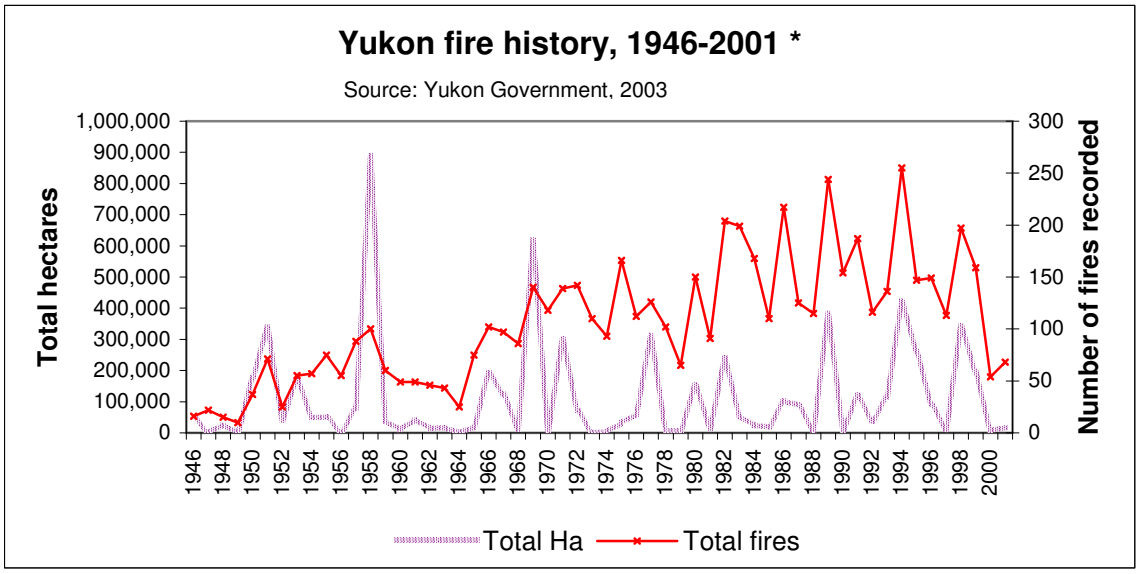
The **West Rancheria** unit lies just north of the Alaska Highway, approximately 80km west of Watson Lake. It is at the eastern edge of the Cassiar Mountains and consists of several small stream valleys that drain into the Meister and Rancheria Rivers. Parent materials in this unit are morainal at higher elevations and glacio-fluvial at lower ones. West Rancheria is best described as an area of rolling to steep foothills dominated by upland forest. It is too small to be an adequate unit for planning at a landscape level.

The **East Hyland** unit is about 45km east of Watson Lake along the Alaska Highway, adjacent to the Hyland River. The unit is bounded by the Hyland River on the west; Contact Creek on the east; the BC/Yukon border in the south, and the headwaters of Irons Creek in the north. East Hyland mainly consists of forested uplands separating Irons Creek from the Hyland River and Contact Creek from Irons Creek. There is a small area of mountainous terrain in the NE corner.

The **Ross River** unit consists of two small sub-units – Coffee Lake and Buttle Creek – within 10-25 km of the community of Ross River on the Robert Campbell Highway. Coffee Lake lies just southeast of the community, while Buttle Creek is northwest toward Faro. Both are situated between the Pelly Mountains and the Pelly River, in the heavily drumlinized Tintina Trench. The terrain is rolling to broken, with much exposed rock outcrop, forming a mosaic of productive forest on morainal landforms and non-productive forest on permafrost sites with deep organic matter. All sites are underlain by a 5-15cm deposit of light-colored volcanic ash with high pH, immediately beneath the surface layer of humus. Upland and lowland forest types are both widespread within the unit. Natural-disturbance type-mapping and general resource reconnaissance were extended beyond the Ross unit boundaries in an effort to put the two small sub-units into a wider landscape perspective.

All four units are subject to the fire-dominated disturbance ecology prevalent throughout the Yukon. Fire statistics for the period 1946 to 2001 (Fig. 1) indicate that all parts of the Yukon are likely to experience at least one wildfire during a 200-year period. Indeed, there are few forest stands more than 160 years old in any of the planning units, and most of them are only small fire-skipped stringers or patches within large burned areas. The Ross River unit differs somewhat from the other three inasmuch as local variations in terrain, stand structure, and permafrost have combined to create complex fire-hazard conditions, resulting in a greater abundance of stringers, patches, and individual fire-veteran trees than at the three southern units.

Figure 1



2.0 Tactical Principles Underlying this Plan

To translate the strategic planning objectives into practice, the following tactical principles were applied, to guide the decision making process in the plan.

2.1 Management according to the features of the site

The management regime proposed for each site has been matched to the attributes of that site, rather than to a rigid set of rules that might not necessarily suit the site concerned. 'Attributes' mean

- The particular biophysical features of the site (terrain, hydrology, soil, elevation, vegetation type etc)
- The particular resource features of the site (timber, wildlife, fisheries, viewscape etc)

and

- The functional status of the site (the way these features relate to each other and to their surrounds).

2.2 The Spatial Continuity Principle

A Forest Ecosystem Network or FEN is a web of undisturbed terrain connecting the main representative forest types, wildlife habitat types, and ecosystem types existing in an area. During timber harvest development, the purpose of the network is to maintain:

- The natural ecological variety of the area
- The natural ecological processes of the component parts

and

- The spatial continuity among them.

Specifically, the networks aimed is to avoid two common and related faults in traditional timber harvest plans. One is the fragmentation of habitats or ecosystem units into isolated blocks. The other is the separation of composite habitats such as wetlands and adjoining forest cover which serve the needs of wildlife only if they are juxtaposed or at least reachable from one another by travel corridors. Part of the strategy in this plan is to ensure that habitat complexes of this kind remain functionally intact, and do not become isolated from each other by uninhabitable ground.

The same applies to seasonal habitats and the ground between them (habitats at different places, used at different times of year).

2.3 Natural Disturbance Mimicry

To a greater or lesser degree, the current state of a forested area is the product of a natural disturbance regime consisting of pest infestations, terrain instability, windthrow events, and – in boreal forests especially – repeated wildfires. Typically the outcome is a forest more diverse than would be produced by the physical features of the site alone. This applies both to the forest as timber and as wildlife habitat. As forest succession takes place, however, the effects of these natural disturbances are gradually lost and the area becomes more homogeneous until the next disturbance event. The degree of biodiversity in a landscape is much influenced by the types of disturbance, their specific impacts, and their spatial extents and frequencies of occurrence. In the case of wildfires, sizes and rates of occurrence are the key variables.[1]

At East Hyland and West Rancheria, rates of fire occurrence have historically been high, and some fires have been very large. Moreover, the forest age-profiles at both areas indicate that the likelihood of fire has been independent of forest age. At East Hyland, the oldest timber with any significant extent is the 131-140 age-class (Table 2). Less than 1% of the East Hyland forested area is older than 140 years; all of the rest has been burned at least once during that time. However, the burn-rate has been declining during the past 100 years or so; mature forest (90-130 years old) has become the most prevalent seral stage, and young productive forest is relatively scarce.[2]

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[1] Fire intensity is another factor, but on a hectare-for-hectare basis, fire size and fire frequency have a greater impact.

[2] Under a disturbance regime affecting various parts of an area randomly, the resulting age-profile would follow a geometric or negative exponential frequency distribution, with young age-classes being the most common and old age-classes scarcest (Li & Barclay, 2001). The mean rate of disturbance determines the degree of difference between the two. Departures from these theoretical frequencies suggest that the disturbance regime is neither random nor systematic, either from site to site or during time. The fact that the age-profile at East Hyland and West Rancheria is roughly the inverse of the theoretical expectation suggests a substantial change in fire history, beginning about 130 years ago. With no reason to suppose that older timber is more fire-proof, the most likely reason is that fire incidence has declined., contrary to the wider trend in Fig. 1 (although the latter may be due in part to improvements in reporting).

One tactical aim of this plan is to counteract the unpredictable impact of wildfires by using timber harvesting as a substitute. The advantages of doing so are considerable. Commercial timber values are obtained instead of destroyed, and the risk of loss in future values is reduced by lowering both the extent of susceptible area and the risk that future fires will spread from one location to others. Also, some of the benefits of fires can still be obtained, but in a more controlled and predictable manner. The indiscriminate course and extent of a wildfire is replaced by planned location, timing, size, and shape of harvest blocks. Strips and patches of residual forest cover can be retained where desired, and silvicultural management can be used to direct post-harvest re-growth along advantageous lines (eg, control of species mix, and shorter regeneration delay).
In this way, at any one point during the course of the plan, the Forest Ecosystem Network and the timber harvest plan divide the area into three management categories with complementary purposes for maintaining ecological diversity while sustaining timber yield:

- places that remain permanently in a natural state
- places that are currently in a natural state but scheduled for harvesting,
- places that are re-growing after harvesting or fire.

When the plan is put into effect, the forest age- and patch-size distribution (or seral stage distribution) and the timber volume profile provide simple yardsticks for measuring how closely the actual state of the area matches the desired state as time proceeds.[3,4]

2.4 Adaptive Management

This plan is based on the current state of knowledge about the four planning units, so far as this could be determined. The rather limited database has been an impediment, but not a crippling one, and the amount of information will undoubtedly improve with time. No matter how much information is compiled, however, knowledge about an area can never be complete anyway. Also, some of the strategies used in the Plan are relatively recent innovations in forest management planning. They are based on established ecological principles, but there are no real-world examples with long enough case-histories to judge their success in the longer term.

To a large extent, any management plan is a form of experiment, whose outcome is a test of success in meeting the aims desired. A difference between the expected and the actual results could mean either of two things: (i) the information-base was insufficient or inaccurate, in which case more or better data need to be acquired; or (ii) the management itself is incorrect in some respect, in which case it ought to be revised. Adjusting a management regime according to its results is commonly termed 'adaptive' management.

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[3] *Volume* for sustainable timber yield; *age* or *seral stage* distribution for non-timber values. These are not, of course, the only yardsticks possible, but age-class and timber volume are ubiquitous in forest inventory data. The variables needed for other types of sustainability measure are not always available.
[4] It is worth noting that Li & Barclay (*op.cit.*) concluded that a stable forest age-distribution may not be achievable on a landscape subjected to large and irregular fire disturbances.

Adaptive management works best if three conditions are met:

1. The plan is implemented in stages rather than all at once
2. Future options are kept open as long as possible
3. The outcome at each stage is monitored

These three conditions have been incorporated into the present Plan.

3.0 Natural Disturbance Zones

For ecosystem-based management, an essential prerequisite is to stratify the landscape into units that are similar within but differ in their ecology from that of other units. Then, management actions can be chosen to suit the ecologies concerned. The basic assumption is that the unit's present-day assemblage of plants and animals is a reflection not only of the physical environment but also of that unit's ecological history. Of particular importance are events that have triggered successional processes and shaped their subsequent course, such as fire, flood, windthrow, and insect or disease outbreaks – collectively termed 'natural disturbance events'. Landscape units can be classified according to the type, frequency, and severity of these events. Forested areas lend themselves readily to this.

Pages 45-48 of the *Timber Harvest Planning and Operating Guidebook* (Forest Resources Canada) describe five Natural Disturbance Zones (NDZs) that occur in the SE Yukon landscape. In the four planning units for this project, these zones are easily recognizable and so provide a suitable basis for developing forest management strategies.

The five zones are:

NDZ 1	Riverine	Areas actively influenced by water on floodplain rivers >7m wide
NDZ 2	Lowland &Transitional.	Areas with increased available summer moisture. Forests tend to acquire uneven age stand tendencies due to extended periods without fire.
NDZ 3	Simple (homogeneous) upland	Lack of prominent terrain features. Dry conditions encourage large, regular fires.
NDZ 4	Complex (heterogeneous) upland	Prominent terrain features and dry conditions result in complex fire patterns
NDZ 5	Subalpine	Higher elevation areas, defined by the presence of subalpine fir, indicating lengthened fire rotations and uneven age stand tendencies

However, the four planning areas also contain certain features that were used to bring the NDZ boundaries into better correspondence with local site attributes. In turn, this enabled

a closer match between the NDZs and their respective management objectives. The boundary realignments and their associated rationale were as follows:

- **The Riverine Zone (NDZ 1) was extended to all mapped watercourses.**

  The natural processes and site conditions characterizing the Riverine zone can be found on all classifiable streams in the three planning areas, not just those >7m wide. The resulting 'extended' Riverine zone varied from a few meters to tens of meters wide, and covered much more of the planning area than otherwise.

  Maintaining the integrity of this zone will be paramount to all resource values within it and adjoining it. Accordingly, for all intents and purposes, the Riverine NDZ is not harvestable, and for purposes of mapping, its boundaries were made to coincide with those of the Riparian Reserve as defined in the *Timber Harvest Planning and Operating Guidebook* (1999).

- **The Lowland Zone (NDZ 2) was also extended to all mapped watercourses, and to hygric or wetter sites in the upland.**

  All receiving, organic, or transitional sites adjacent to or connected to the revised Riverine zone were observed to meet the Guidebook definition of a Lowland site. For operational planning purposes, the white spruce, black spruce, tamarack forest, and timber-brush complexes that characterize this zone are easily identifiable at stand level. Except in large river valleys with extensive operable stands of spruce on mesic to subhygric sites, most of the Lowland zone is not harvestable because (a) it is either a very narrow band adjacent to the Riverine Zone, or (b) it has adverse site conditions that preclude harvesting or silviculture operations.

- **The Simple and Complex Upland Zones (NDZ 3 & 4) were amalgamated at landscape level.** As stated above, differences in natural disturbance regimes must be reflected in distinctive ecosystem attributes if they are to be useful to operational planning. However, the Guidebook description, air photo interpretation, and reconnaissance observations indicated that there is insufficient difference in the forest characteristics and vegetation types of these two NDZs to distinguish between them at a landscape level. The nature and frequency of natural disturbance events is likely very similar for both zones. For strategic planning purposes, therefore, they were regarded as just one zone and mapped accordingly.

  At stand level, however, these two NDZs are easily distinguishable. The differences are mainly a matter of scale rather than differences in kind. The complex upland has much smaller stand types with a greater variety of ages (fire skips), crown closures, and species mixes etc. These characteristics are almost entirely related to edaphic factors (moisture & nutrient status), which in turn are influenced by terrain. Evidence of the similarity between these two NDZs is demonstrated by the fact that identical vegetation types can be found in both the simple and the complex uplands if similar edaphic conditions are met.

Nevertheless, this does not mean that all parts of these two zones should be managed identically. The original distinction between them must be maintained when management planning is done at stand level. The broad operational strategies may be similar at both, but the scale at which they are practiced will differ greatly. For example, hectare for hectare, the complex zone should have greater retention, smaller opening sizes, more irregular opening shapes, and more openings than the uniform zone. Detailed pre-harvest prescriptions will be essential for developing operational plans that suit the specific terrain, stand, and site types existing at each proposed harvest site. In due course, the difficulty of mapping complex upland sites becomes resolvable when the stand level of planning is reached.

4.0 Composition of the Areas

4.1 Forest Types

The forest cover in each planning unit has been grouped into the following types, based on species composition:

- Spruce Types (White Spruce [SW] >80% composition; includes all Fir [F] types and Black Spruce [SB] leading types of <80% composition).
- Pine Types (Pine [P] >80% composition)
- Deciduous Types (Aspen [A], Balsam Poplar [B] and White Birch [W] stands >80% deciduous composition).
- SW/P & P/SW Types (SW or P leading with <80% composition and P or SW as a secondary species). SW includes F and SB as per Species Code #1 (above).
- Conifer-leading Mixedwood (SW, SB, F or P leading with <80% composition and Deciduous as a secondary species).
- Deciduous-leading Mixedwood (Deciduous-leading with <80% composition and Coniferous as a secondary species).
- Black Spruce (stands with >80% composition of SB including all Larch [L] stands, if any).

4.2 Land Cover Classification, Forest Age, and Patch Size

East Hyland

The amount of forested area is about 98,000 hectares, or 89% of the total planning unit (Table 1). Of this, however, only 56,000 hectares (52%) are classed as currently stocked with productive forest; the rest is non-forest (10%) or has not yet regained a productive cover of trees since previous fires (NSR 38%; Table 2). This last figure is somewhat inflated, since the database has classified large burned areas uniformly as NSR, ignoring residual patches of timber within and excluding them from the forest age datafile. From a habitat perspective, however, such patches have disproportionate value to wildlife. Also, the amount of NSR during each planning period has an important bearing on the sustainable timber supply. For future planning purposes, areas presently listed as NSR should be re-classified

by age, typed by species (where possible), and included the forest age profile (see *Recommendations*, Section 7).

West Rancheria

The amount of forested area is small, and covers less of the planning unit than at East Hyland (80% versus 89). However, the proportion classed as productive is much higher than at East Hyland, and the amount of NSR is small (Table 2). The forest age profile at West Rancheria is highly uneven, with very little timber less than 90 years old or more than 130. The late 1800s seem to have been a time of major fires. All forest types except perhaps pine were affected similarly. A few fires in the early 20th century produced some younger pine.

Watson Lake

The Watson Lake unit is the second-largest of the four and has a similar ratio of forest / non-forest cover to East Hyland and West Rancheria (Table 1). Again, most of the timber is mature (80-130 years old). The amount of very young (<30 yrs) and very old (>130) is small (Table 2). Lake, swamp, and places classed as urban occupy a significant portion (13%) of the total area (Table 3).

Ross River

Together, the two Ross River sub-units are about the same size as West Rancheria, but at only 1800 ha the Coffee sub-unit is very small, and only about $^{n2}_{\star}$ of it is forested (Table 1). The Buttle sub-unit is somewhat more forested, but still less so than any of the three larger units.

At all planning areas except Watson Lake, the amount of alpine and other minor cover types is small (Table 3).

Table 1.

GROSS LAND COVER of the PLANNING UNITS					
PLANNING UNIT	TOTAL FOREST (ha)	%	TOTAL NON-FOREST (ha)	%	UNIT AREA (ha)
East Hyland	97638.6	89%	11583.6	11%	109222.2
Rancheria	8839.4	80%	2239.3	20%	11078.7
Watson Lake	33585.2	85%	5886.1	15%	39471.3
Ross River - Buttle	7195.7	73%	2600.2	27%	9795.9
Ross River - Coffee	1182.8	65%	625.0	35%	1807.8

Table 2.

GROSS FOREST AGE COMPOSITION (all forest types combined)									
PLANNING UNIT	TOT. AREA	NSR		31-79 yrs		80-130 yrs		131+ yrs	
	(ha)	<30yrs (ha)	%	(ha)	%	(ha)	%	(ha)	%
East Hyland	109222.3	41432.7	38%	13295	12%	42758.5	39%	152.4	0%
Rancheria	11078.7	466.5	4%	377.8	3%	7573.2	68%	422	4%
Watson Lake	39471.3	3229.5	8%	2860.6	7%	26851.6	68%	643.6	2%
Ross River – Buttle	9795.9	75.1	1%	839.8	9%	5778.5	59%	502.2	5%
Ross River – Coffee	1807.8	89.7	5%	261.2	14%	681	38%	150.8	8%

Table 3.

COMPOSITION OF THE TOTAL PLANNING UNIT - NON FOREST FEATURES											
PLANNING UNIT	TOT. AREA	NON-PROD.		ALPINE		ROCK		LAKE, SWAMP, etc		URBAN	
	(ha)	(ha)	%	(ha)	%	(ha)	%	(ha)	%	(ha)	%
East Hyland	109222.3	6712.9	6%	2014.8	2%	122.7	0%	2619.3	2%	113.9	0%
Rancheria	11078.7	1970.6	18%	57.9	1%	0	0%	210.8	2%	0	0%
Watson Lake	39471.3	571.9	1%	0	0%	0	0%	4094.9	10%	1219.3	3%
Ross River - Buttle	9795.9	2184.2	22%	0	0%	0	0%	415.9	4%	0	0%
Ross River – Coffee	1807.8	553.1	31%	0	0%	0	0%	71.9	4%	0	0%

Patch (stand) size

The numbers of forest patches of various sizes at each planning unit are shown in Table 4. [5] Patch sizes varied considerably among the units, but very large patches (>500 ha) were uncommon. At East Hyland, West Rancheria, and Watson Lake, most patches were in the 50-500 ha size-range. At the two Ross River sub-units, smaller patches were more common.

At all planning units except perhaps East Hyland, however, these size-distributions were not necessarily representative of the wider landscape, since the planning boundaries were not based on natural landscape units. Buttle Creek and Coffee Lake were probably least reliable.

[5] For these calculations and those in Table 2, each polygon in the datafile labeled with a single forest cover-type and age was considered a 'patch' . Each patch was taken to be the product of a single stand-destroying event (probably fire) at file-date minus polygon age. In some cases, neighboring patches with the same age but different cover-type may have been produced by the same event. However, this possibility was disregarded rather than assuming it with no evidence. For calculating patch size, polygons that overlapped the planning unit boundary were measured to full extent, including the portion outside the boundary. For age-class distributions (Table 2), the measurements stopped at the planning unit boundary.

Table 4

PATCH-SIZE DISTRIBUTION

Number of patches

Size class (ha)	East Hyland	W. Rancheria	Watson Lake	Buttle Creek	Coffee Lake
<10	285	34	114	98	10
>10 to 25	354	16	162	38	2
>25 to 50	296	35	162	36	5
>50 to 100	249	42	144	27	5
>100 to 500	224	43	123	27	3
>500 to 1000	20	2	3	1	2
>1000	15	4	2	2	4
n =	1443	176	710	229	31

4.3 Wildlife

Potential value to wildlife was assessed from two chief perspectives: firstly, the *intrinsic attributes* of the site, taking the following factors into account: elevation, slope and slope position, terrain type, aspect, forest cover type (stand age, structure, and leading species). The second perspective was that of the site's *context.* This entailed four types of consideration:

(i) the site's relative value as compared to surrounding places;
(ii) the extent and location of similar habitat in other parts of the area;
(iii) juxtaposition with other habitat types to which the site might be functionally related (eg, forage at one place, shelter at another); and
(iv) use for travel among adjacent parts of the wider area and to/from places outside the Plan area. At the landscape planning level, this wider perspective has the important role of ensuring that the principles of 'adjacency' and 'connectedness' are met (Section 2).

Forest development impacts on wildlife are often construed as solely negative, but this is not the case. Mature forest habitat is lost for a period of time, but certain benefits also occur, and a balance has to be struck between the two:

- Total species diversity [6] is commonly highest during the mid-stages of a habitat succession. Mature and near-mature forests are usually less diverse than earlier and later stages. Nonetheless, some species occur only in young forest, others only in old forest. Therefore, at a landscape level, maximal diversity is attained with a mosaic mixture of stages.

- Certain 'focal species' can be expected to benefit, locally and seasonally, from timber harvesting. These are species that respond to conditions occurring predominantly or solely at particular stages in the seral sequence. Examples are moose and black bear (responding to the increased shrub cover during the first 15-30 years after logging or

[6] Measured as relative abundance and variety.

fire), and, potentially, caribou (responding to increasing lichen cover when a dense tree canopy is opened up [7]).

- Certain focal species can also benefit from particular types of stand management such as control of the post-harvest stand structure or tree species mix. Examples include various migratory songbirds, and furbearers such as marten and fisher. Pre-harvest assessment of the potential is an important prerequisite for this, as discussed in Section 5.2.

4.3.1 Wildlife information cited in reports

Wildlife and habitat locations cited in Yukon resource reports, or related by Yukon personnel familiar with the four planning units, include the following:

Furbearers – especially marten – are an important concern at each unit, East Hyland in particular. The edge of the burned area near Blind Lake, the drainage of Lost Creek, and the Hyland River, are considered important for beaver and wolverine. The wetland complexes and adjacent forest in the Watson and Garden Creek areas are also important for maintenance of furbearer populations in general and key regional beaver habitat specifically.

Amphibians: Wood frog, boreal chorus frog, spotted frog, and long-toed salamander are important in riverine and riparian areas. Amphibians are considered scarce in the Yukon generally. Although it is not known whether any or all of these species inhabit the planning units, management zonation proceeded under the assumption that protecting their key habitats will also protect the species.

Fisheries: The Pelly River and Beautiful Creek in the vicinity of the Ross River units contain salmon habitat. Other information appears to be limited, but a need for regulations and access controls to limit catches has been mentioned in various documents. Fish surveys are needed at key watercourses to facilitate forest management planning. In their absence, all watercourses within the planning unit should be considered fish-bearing by default.

Blind lake: Has the Yukon's only recorded colony of Black terns, a red-listed species in the Yukon.

Moose: A key sport hunting species and cultural food resource. The East Hyland area is considered to be especially important for moose, and all ground within 4 km of the Hyland River is said to be moose winter range and calving habitat. All lowlands within 2 km of the Liard River are also considered to be winter range. The wetland complexes at Irons Creek and Lost Creek, Watson Creek, and Garden Creek have good winter range potential. The Pelly River lowlands have high moose winter range potential, and the islands in the river have been identified as calving grounds.

[7] Pine-dominant forest types growing on poor soils commonly have an understorey of terrestrial lichens whose abundance (and amount of usage by caribou) is inversely proportional to tree density and crown closure (Lance & Mills, 1996). As the stand matures, lichen abundance declines. Experiments at the University of Northern BC indicate that the decline is reversible by partial removal of the overstorey (D. Coxson, unpublished research, ongoing).

Caribou: Maintenance of the Rancheria Herd winter range is a priority. This range does not presently extend into West Rancheria or East Hyland, but does extend into the western edge of the Watson Lake unit. (The mapped winter range is currently excluded from development under this plan). At Ross River, the two sub-units lie between key areas used by the Pelly, Finlayson and Tay Herds, and could show some incidental use by any of these three herds. Expansion of caribou range is a desired objective in the south Yukon generally.

Boreal owl: Considered to need large contiguous areas of mature spruce and riparian forest.

Three-toed woodpecker: Considered to depend on older coniferous and mixedwood forest.

Pileated woodpecker: Depends on old growth white spruce forest. Southern Yukon is the northern edge of this large woodpecker's range.

Bald Eagle: High-value nesting sites exist within 1km of the town of Watson Lake.

Listed species: Some 49 species, mostly birds, are listed as being 'at risk' or 'possibly at risk' in the Yukon, and many others are classed as 'sensitive' (Appendix 3). Some of these are arctic or maritime and do not occur anywhere near the four planning areas. For many species, however, the Yukon is the northernmost part of their range, and populations may fluctuate more than elsewhere. Wildlife inventory and monitoring should be included in forest management plans, for the purposes of adaptive management (Section 2).

4.3.2 *Wildlife 'sign' and sightings during field reconnaissance*

Ross River

- Squirrel use was conspicuous (heavily used trails compacting the duff) in some of the denser mature spruce stands sampled.

- No moose were sighted in either of the sub-units, but SW of the Buttle Creek area two were seen in alpine/subalpine habitat (as typical of moose during warm summer weather). Some trails were evident in the lowlands along the Pelly River, and presumably moose would be resident in the wetland complexes of the Buttle Creek area. The Coffee Lake area had scant habitat and no sightings, due to the small size of the area. Better and more extensive moose habitat exists southwest of the Ross River unit

- Many game trails (denoting presumed winter use) were seen on the tops of grassy south-facing slopes adjacent to timber, particularly in the larger recently-burned deciduous types in and around the two Ross River sub-units.

- Caribou were seen in alpine habitat of the Pelly Mountains SW of the Buttle Creek area. However, with the exception of higher elevations on the SW edge of that area, good caribou winter range is absent from the Ross River sub-units.

- Waterfowl were noted in many of the small lakes and ponds scattered throughout both the Ross River sub-units.

Watson Lake

- In general, less sign and fewer sightings were recorded in this unit due to the level human presence in it. Many of the natural lowland riparian corridors have been disrupted by non-forestry related development. Where this has occurred, the plan will propose the addition of adjacent upland stands to the Forest Ecosystem Network (FEN) to re-establish continuity in these corridors.

- Waterfowl were noted in Watson Lake and the wetland complex at the NE edge of the town, including the Wye / Second Wye / Hourglass lakes chain.

- High-value Caribou habitat is extensive on both sides of the Liard River immediately south of the town of Watson Lake.[8]

East Hyland

- Irons Creek, Lost Creek, and the Hyland River lowlands appear to be prime moose habitat, and many moose were seen. These and other sightings described below are noted on the NDZ zonation map.

- Most of the moose sightings were of cow/calf pairs, and most were within riparian areas. Springs were noted in upper Irons Creek and its tributaries.

- NSR burned areas showed little use. Heavy accumulations of slash in the burns would be difficult for moose to traverse. Accordingly, connectivity among riparian areas will be highly important to moose.

- Caribou were sighted in alpine parts of the northeast corner of the East Hyland area. Many alpine-to-valley and valley-to-valley trails were also seen. Subalpine sites with abundant terrestrial lichens occur in this same northeast corner. Elsewhere, at lower elevations, terrestrial lichen sites also occur along Irons Creek, the Hyland River, and especially, south of Blind Lake.

- Black bears were seen along the Alaska Highway and in old cutblocks in the southeast corner of East Hyland. Some possible bear spring feeding scars were noted on spruce near wetland adjacent to upper Irons Creek.

- Two groups of swans were found at Irons Creek / Lost Creek wetlands (see Map).

West Rancheria

- Except for an occasional moose in the main wetland / creek complex, very little wildlife or wildlife sign was seen at West Rancheria. Severe mining disturbance has occurred throughout the alpine zone in the mountains to the west.

[8] These areas have since been included in the Watson Lake planning unit.

- Two prominent wildlife trails were noted along the main creek valley and along another valley to the north-west. Moose evidently use these trails to travel between wetland / lake complexes in the west and lowlands near the Meister and Rancheria rivers.

- Few places with extensive terrestrial lichen cover were found at West Rancheria. Caribou winter habitat is much more extensive to the east of the area.

- One possible wildlife 'lick' was seen, but with little evidence of wildlife use. Many stands of timber at West Rancheria are at, or just past, the intermediate or 'stem exclusion' stage of growth, which typically has little habitat value to wildlife.

4.4 Visual resource values

A brief desk study and visual reconnaissance was done to assess the visual resource in each planning unit. Parts of the Watson Lake, East Hyland and West Rancheria units are visible from the Alaska Highway. The viewscape surrounding Watson Lake town itself includes a significant portion of the Watson Lake planning unit. Both of the Ross River sub-units are visible from the Robert Campbell Highway, and a portion of the Buttle Creek sub-unit is visible from points on the Dena Cho historical trail along the Pelly River.

Parts of the landscape that would be visible from from highways, trails, campsites, and other accessible vantage points are referred to as Visual Landscape Units (VLUs), and are shown on the maps accompanying this report. The boundaries of these VLUs are approximate only and will need refinement at the operational planning stage.

Also at operational planning stage, a preliminary assessment of each VLU's 'sensitivity' is conducted, and a Visual Sensitivity Rating (VSR) is applied by factoring-in various biophysical features, viewing distance, and other conditions which influence the viewer's perception. The biophysical features include: terrain type and amount of topographic relief, slope gradient and aspect, vegetation type and variety, and visible rock, water, and other openings. Viewing conditions take account of distance from the viewer, angle of view (straight-on or peripheral), viewing frequency and duration of view (ie, 'moving', as from a vehicle, or 'static', as from a fixed vantage point), Other standard factors include: the potential number of viewers, their level of expectation, existing site disturbances, and the VSR of any competing scenery nearby.

The resulting VSR indicates the amount of visual alteration that would be considered acceptable within a VLU at any given time. Amount of acceptable alteration is measured in two parts: (i) as a percentage of total VLU area (in perspective view); and (ii) as an acceptable limit in terms of the potential for viewer concern. The final VSR is expressed as a number from 1 (high) to 5 (low) where the higher the rating, the more likely that a proposed alteration would cause viewer concern. The following table identifies the definitions and prescribed limits of alteration for each VSR class:

VSR CLASS	DEFINITION	ALTERATION LIMIT (%)
1	*Very High* sensitivity toward any visual alteration. The area is extremely important to the viewer and there is a very high probability that the viewer would be concerned if the landscape was visually altered in any way.	0
2	*High* sensitivity toward any visual alteration. The area is very important to the viewer but a somewhat lower probability of concern if the landscape was visually altered in any way.	0 – 1.5
3	*Moderate* sensitivity toward any visual alteration. The area is important to the viewer and a moderate probability of concern if the landscape was visually altered.	1.6 – 5
4	*Low* sensitivity toward any visual alteration. The area is somewhat important to the viewer but there is a low probability that the viewer would be concerned if the landscape was visually altered.	5.1 – 12
5	*Very Low* sensitivity toward any visual alteration. The area may be somewhat important to the viewer but the viewer would unlikely be concerned if the landscape was visually altered.	12.1 – 25

The Visual Sensitivity Rating is the basic means of achieving the protection and effective management of the visual resource. However, at the operational level, and once any proposed alterations to the viewscape are scheduled into the development, a Visual Impact Assessment (VIA) is needed for all proposed alterations to the Visual Landscape Units.

The VIA is a more refined assessment consisting of, firstly, a field study to confirm the vantage points, refine the initial VLU linework, and obtain a photographic record of the pre-development landscape. Second is an office review of the proposed cutblock design(s), with computer modeling to simulate their anticipated visual impact. At this stage, blocks can be re-positioned or re-shaped to ensure that the final VIA meets the prescribed alteration limits to the VSR.

4.5 Forest Health

Forestry Canada's *Forest Insect and Disease Condition Reports for the Yukon* from 1988 to 1995 indicate a relatively low incidence of pests and diseases in the Yukon generally. The recent Spruce Beetle infestation in the Haines Junction / Kluane area is thus an exception.

Reconnaissance of the four planning units for this report yielded minimal evidence of forest health concerns. Scattered subalpine fir and spruce snags in some stands are likely the result of western balsam bark beetle (*Dryocetes confusus*) and spruce beetle

(*Dendroctonus rufipennis*) respectively. Pine stands appeared to have very low incidence of diseases, although some western gall rust (*Endocronartium harknessii*) was found during ground sampling. Aspen shoot blight (*Venturia macularis*) and serpentine leaf miner (*Phyllocnistis populiella*) was noted in some seral aspen stands. Other agents undoubtedly exist at endemic levels, but no one pest or disease would seem to be a concern now or in the near future.

Two main factors maintaining this low level of pests and diseases are (i) frequent stand-initiating fires and (ii) prolonged cold winter temperatures. Therefore it is unlikely that specific stand-level actions will be needed to maintain this situation in any of the four planning units during the term of this plan. However, some generic stand-level actions have been prescribed in section 5.4 as a form of 'insurance' against inadvertently increasing these pests in future.

With regard to abiotic forest health factors, fire and windthrow occur as both endemic and catastrophic events. Since both agents are a part of the natural disturbance regime in boreal forests, elimination of either agent is neither practical nor ecologically prudent. However, management of their extent and magnitude is essential if society wishes to reduce timber losses and sustain the resource for other purposes. Without knowing the extent to which these agents can be managed without disrupting the rest of the ecosystem, the objectives must be two-fold. Firstly, fire and windthrow should continue to be monitored throughout the Yukon to develop regional management strategies (protection plans). Secondly, the potential for catastrophic events, or even a rise in endemic levels, must not be allowed to occur from forest management itself; ie, "do not disrupt the ecosystem by making the problem worse"**.**

The first objective is beyond the scope of this plan, but the second objective must be part of the management strategy for the four planning units in this report. Section 5.4 outlines some preventative measures that can be used against both fire and windthrow at stand level and whole-unit level alike.

4.6 Cultural Resources

These include recreational and subsistence hunting and fishing, fur-trapping, commercial guide/outfitting, tourism, archaeology, and cultural values important to the Kaska Nation. Discussion and documentation of these for all four planning units is underway, and will be essential to complete before forest harvesting operations begin at any of the units.

The necessary consultations should take place in two stages: firstly, at the Referral stage of this plan, to ensure that cultural values important to the Kaska Nation are recognized and reflected in the landscape-level management zonation of each planning area. These values would include special-use sites or structures such as cabins, hunting or fishing camps, and trapline routes; traditional places for collecting medicinal or food plants; and places that have Native heritage or spiritual value.

The second phase of consultation should occur during the Pre-Harvest Assessment (see Section 5, below). This is to confirm the foregoing values at a site-specific level before timber harvesting begins, and to devise any mitigating actions required for protecting these values during harvesting and afterward. This second level of consultation would best be achieved via joint examination of the site by a project forester and a traditional land steward or other knowledgeable person nominated by the Kaska Nation (see *Recommendations*, Sec. 7).[9]

5.0 Operational Planning

If the landscape-level objectives of the plan are to be achieved, they must be expressed in terms of appropriate stand-level activities. It is this translation of landscape-level goals into stand-level actions that is considered the realm of operational planning. This section of the report therefore provides an overview of the key stand-level management proposed.

5.1 Management Zonation

As discussed at the start of this report, the development of management zones linked to the natural disturbance zones allows achievement of resource management objectives at both the landscape and stand levels. Once the landscape is delineated to identify resource priorities or values, stand level strategies can be focused on those portions of the landscape for which they are most appropriate. For the purpose of developing an interim wood supply, each of the four planning units has been divided into three such management zones:

- Forest Ecosystem Network (**FEN**):
- Integrated Resource Management Zone /Undifferentiated (**IRMZ-U**):
- Integrated Resource Management Zone-Differentiated (**IRMZ-D**):

The amount of each of these three zones in each planning unit is shown in Table 4, along with notes defining the makeup of each zone.

[9] Except for the northern portion of East Hyland (see *Recommendations,* Sec. 7), all documented land claim areas or settlement lands have been excluded from each of the four planning units. The consultation process described above is concerned only with cultural values at or near to places scheduled for timber harvesting.

Table 4.

MANAGEMENT ZONE SUMMARY											
PLANNING UNIT	TOT. AREA	IRMZU*		IRMZD**				FEN***		ALTERNATE USE ****	
				In Blocks		Not in blocks					
	ha	ha	%	ha	%	ha	%	ha	%	ha	%
East Hyland	109222.2	21404.5	20%	9201.5	8%	25648.9	23%	52876.6	48%	90.7	0%
Rancheria	11078.7	562.1	5%	3022.2	27%	2168.4	20%	5326	48%	0.0	0%
Watson Lake	39471.3	0.0	0%	1403.4	4%	6471.8	16%	21385.7	54%	10210.4	26%
Ross River - Buttle	9795.9	0.0	0%	1024.4	10%	1446.0	15%	7250.1	74%	75.4	1%
Ross River - Coffee	1807.8	0.0	0%	287.4	16%	186.1	10%	1334.3	74%	0.0	0%

* IRMZ-U (Integrated Resource Management Zone - Undifferentiated) includes all burned areas that have occurred within the planning units during the last 30 years. These areas have not been adequately inventoried to delineate proper forest types. This zone is generally labeled NSR on the forest inventory maps.

** IRMZ-D (Integrated Resource Management Zone - Differentiated) includes all working forest as described in the report.

*** FEN (Forest Ecosystem Network Zone) includes all areas where other values are considered paramount (ie, no-harvest zone). See report description.

**** Alternate Use Zone includes all private land, Yukon land parcels, federal land parcels, agricultural leases, block land transfer (Watson Lake), permanent sample plots (100m radius), research areas, and urban areas (as designated in the forest inventory). Harvesting is not permitted in this zone.

The **FEN** (see *Glossary*) consists of that portion of the planning unit where the management of resources other than timber is considered paramount. With the exception of access road crossings, harvesting is considered incompatible with other resource values in this zone and will not occur in the short term. However, management of other resources should continue, with emphasis on fire protection to maintain the particular values of this zone.

The FEN has been designed from three inter-related concepts:

1) Incorporate a wide variety of resource values that occur within the planning units (and in the Yukon in general).
2) Incorporate landscape connectivity (Spatial Continuity Principle)
3) Incorporate representative ecosystems as expressed by forest or habitat types.

These are elaborated as follows:

1) <u>Incorporate a wide variety of resource values that occur within the planning units (and in the Yukon in general).</u>

   The initial value on which the FEN is built is maintenance of the Riparian Management Zone (RMZ) along all fish streams. As per the *Yukon Timber Harvest Planning and Operational Guidelines*, the intent of the RMZ is to protect the integrity of the reserve zone; minimise or address windthrow in the reserve zone; retain important wildlife attributes, and provide visual screening for wildlife. Not only does the FEN serve these functions, but it also incorporates a much broader range of landscape values observed or outlined in various resource reports for the planning

units. All values in the "Values Table" by J. Adamczewski *et al.* have been incorporated. Examples of these are as follows:

Biodiversity at Landscape Scale. "*Establish connected reserve network from logging that takes in areas of key importance to sensitive species (e.g. a core caribou winter range, old riparian white spruce for forest-interior specialist birds), or rare habitats (e.g. fire-skips with exceptionally old forest). Reserves should be built around riparian buffers".*

Marten at Landscape Scale. "In general, marten habitat needs in the planning areas can be provided for via reserve networks, forest age-class targets and riparian buffers, and substantial untouched leave areas between cut-block aggregates."

Amphibians at Landscape Scale. "Provide for amphibian habitat and dispersal by connected reserve network focused on riverine and riparian areas. Unbroken natural corridors are particularly important to ensure the continued health and expansion of [sic] *their species."*

Moose at Landscape Scale. "Before commencing forest development in an area, undertake mapping to identify critical habitat elements that include the following:

- *Winter range for moose in the plan area is a matrix of*
  - *Open canopied mixed coniferous, pine or spruce leading forest stands*
  - *A mixture of early and mature seral forest classes*
  - *Lakes, wetlands and riparian features*
  - *Unique elements such as burns*

The maps for the four planning units show that the FEN in each unit has been specifically designed to incorporate the landscape-level prescriptions/thresholds for all of the above values. Other values considered in the design of the FEN were as follows:

- Inclusion of all known "key habitats" (see the aforementioned "Values Table")
- Mapped caribou winter range and additional stands with substantial lichen content
- Cultural features (cabins, trails, campsites)
- Unique features such as major game trails, mineral licks, etc.
- Red-listed species (e.g. Black Tern)
- Old growth retention

The above examples show that numerous non-timber resource values have been considered in the design of the FEN, and that riparian management is only one of those values.

2) Incorporate landscape connectivity

The concept of Spatial Continuity and Connectivity described in Section 2.0 is one of the key principles of this plan and is incorporated at both the landscape and stand levels.

On a *landscape level* the FEN should connect various land units such as protected areas, sensitive areas, key habitats, rare ecosystems, riparian reserves, etc. For animal travel corridors, the two most important types of connectivity in the boreal forest are:

1. Alpine to Lowland (mainly via major watercourses)
2. Lowland to Lowland (along watercourses)

Virtually all of the seasonal movements by resident wildlife follow this pattern. Upland is usually only a temporary stop or occasional habitat. Therefore, the least connectivity necessary would be upland-to-upland. The FENS in this plan adhere to this pattern by being centered on the highly important riparian features to emphasize the above two types of connectivity over the landscape. Upland to upland connectivity is easily integrated with the FEN at *stand level* using Variable Retention Harvesting in the adjacent IRMZ-D (as outlined in Section 5.2).

3) Incorporate representative ecosystems as expressed by forest or habitat types.

Riparian ecosystems alone could hardly be said to represent the landscape, and so a forest ecosystem network (FEN) must include representation of many forest types or habitats. The following is a list of habitats well represented by the FEN:

- All of the Riverine Natural Disturbance Zone (NDZ 1) which was considered equivalent to the mapped riparian reserve on all streams.
- All of the Lowland (NDZ 2) in the West Rancheria unit, about 99% of the Lowland in the East Hyland, and about 90% of the lowland in the Watson Lake and Ross River units.
- All of the Subalpine (NDZ 5) in the East Hyland area and about 80% of the Subalpine in the West Rancheria.
- The most extensive terrestrial lichen sites in all units (open upland, NDZ 3& 4, pine forest <25% crown closure)
- Any observed or known unique cultural or natural features (trails, licks, cabins, residences, Blind Lake, Lost Creek-Irons Creeks wetland complex, Watson/Garden Creeks wetland complex, etc.)
- All inoperable forest (>45% slope) in lowland , upland, and subalpine NDZs in all units
- All non-productive forest types (pure upland and lowland Black spruce, open canopy forest/brush complexes, treed riparian types, etc.) in all units
- All upland deciduous or deciduous-leading stands in all units.
- Most upland mixed (deciduous leading) forest in all units
- Open grassland and associated forest interface in all units
- All alpine areas (present in only the East Hyland and West Rancheria units).
- Most old growth forest (mainly stringers and larger fire-skipped patches >130yrs old)
- Many dense upland pine stands (>60% crown closure)

- Immature forest adjacent to riparian areas
- Rock outcrops

The **Integrated Resource Management Zone / Undifferentiated (IRMZ-U)** consists of those portions of the landscape that have been burned within the last 0-30 years. These areas are currently labeled *Not Satisfactorily Restocked* (NSR) in the forest inventory, and consist almost entirely of Upland. Reconnaissance of these areas was done to exclude riverine, riparian and lowland portions that can contribute to the FENs when these portions grow into future forests. However, this zone is referred to as '*undifferentiated*' because not all candidate habitats are included in the FENS as shown on the maps. Some examples of ecosystems and / or habitats that could eventually be included in FENS are as follows:

- Substantial and highly important old growth patches and stringers existing within burned areas
- Extensive upland spruce/willow areas suitable as wildlife habitat
- Burned areas with significant vertical structure (single live trees, snags and clumps of advanced regeneration)
- Open grown pine stands developing lichen cover
- Extensive areas of immature deciduous-leading and mixedwood stands

Examples of ecosystems and / or habitats that could eventually be transferred to Integrated Resource Management Zones / Differentiated (see next) are as follows:

- uniform upland immature pine stands
- uniform upland and or lowland spruce stands
- mixed upland pine / spruce stands

Although the tendency in the past has been to ignore these types of stands, the IRMZ-U must be designed so that the right portions of the landscape are allocated to the right resources. Within ten years, the IRMZ-U must have a multi-resource inventory completed to ensure that habitats elsewhere are replaced as logging proceeds. Pending an evaluation of their best use, portions of the IRMZ-U can be re-designated into Zones 1 (FEN) or 2 (IRMZ-D). By planning to diversify the landscape early on, we can offset the usual trend toward large-scale homogeneity that renders ecosystems susceptible to catastrophic losses.

In keeping with the principle of Natural Disturbance Mimicry, the **Integrated Resource Management Zones / Differentiated (IRMZ-D)** at Ross River, Watson Lake, East Hyland and West Rancheria are almost entirely composed of Upland NDZ, in which the ecological norm is frequent, various-sized stand-initiating fires. The relatively small portions of Lowland and Sub-alpine in the IRMZ-D represent the correspondingly less frequent stand-initiating events in these NDZs. It is this portion of the landscape in each planning unit where harvesting is judged compatible with other resource uses and diversifies the forest age-distribution.

Harvesting in this zone allows the timber resource to be utilized, but the IRMZ-D is not solely devoted to timber harvesting. Because landscapes are harvested stand-by-stand, the IRMZ-D is the zone that connects stand-level management to landscape-level objectives. Suitable planning at stand level integrates timber production into the landscape by managing the forest age profile, patch size, and stand structural attributes in a way that sustains other resource values

Success in stand-level planning depends on a rigorous Pre-Harvest Assessment conducted by a forester with input from other relevant resource professionals. Two crucial reasons for this assessment are:

- The landscape is an amalgamation of site-specific ecologies. Thus, accurate assessment site by site is required for selecting management practices that will yield predictable site-specific results

.

- If the information available at landscape level is scarce or incomplete, certain resource features may escape notice. In many cases they come to light when pre-harvest assessments are done, and the landscape plan can then be adjusted accordingly. In extreme cases, the landscape plan can only be done at all by a process of iteration from assessments site by site.

5.2 Silviculture Systems and Harvest Methods

Integration of multiple resource values into timber harvesting will depend first and foremost upon selecting silviculture systems and harvesting methods that make a satisfactory fit between the objectives desired, the basic ecology of the site, and its current state. **Silviculture systems** *per se* are directed at the regeneration and subsequent growth of a commercially important tree species (Smith 1986). There are only five classic systems; namely, *Selection*, *Shelterwood*, *Coppice*, *Seed Tree*, and *Clearcut* (Weetman 1996). Each of these systems may have one or more variants, but in general they are all directed at growing crop trees for harvest.

Recently the term ‘alternate silviculture system’ has come into vogue as the result of demands by the public for a ‘better' way to manage forests. The meaning of **alternate silviculture system**, in British Columbia at least, has generally been applied to "anything other than the clearcut system" in response to public pressure for multiple resource objectives on Crown (and more recently, private) forest land.[10] However, the distinction is not always made between a **silviculture system** (for crop regeneration purposes) and a **harvest method** (how timber is cut to leave behind certain structural attributes for some other purpose). Indeed, most 'alternate' silviculture systems are a combination of both. 'Patch Cutting' (a common prescription in the Yukon), is actually just a small clearcut (in the classic sense) because the regeneration objective is an even-aged stand (there may of course be other objectives as well). A group of small openings <1ha apiece in a lowland

[10] Although now in common use, the term 'alternate' seems to be a misnomer. 'Alternative' would better describe the demand for "anything other than ... "

spruce stand is referred to as a 'selection system' but this too is just a set of clearcuts (albeit very small ones) because the regeneration objective is still an even-aged stand.

The foregoing discussion demonstrates the importance of distinguishing between silviculture actions and harvest methods aimed at non-timber resources, versus actions aimed solely at timber regeneration. Even more important is to understand the dynamics of the various silviculture systems and harvest methods, so as to incorporate them into a pre-harvest prescription that balances timber and non-timber objectives. The point of balance between the two will reflect the relative priority that has been assigned to each objective at the site concerned.

There is no doubt that the prevailing natural disturbance regime in the boreal forest is large-scale even-aged events, mainly wildfires. In the Yukon during the past 50 years, these have averaged about 1100 ha each (Fig. 1). A search for uneven-aged multi-layered stands reveals their rarity. However, this does not mean that no small disturbance events occur, nor does it provide justification for wholesale clearcutting. 'One size does not fit all' across the various natural disturbance zones on the landscape. A wide variation exists around the mean fire size: SD 1588 ha, range 0.8 to 8890. The aim of Natural Disturbance Mimicry (Section 2) is to sustain this variety via management actions. One effect of failing to do so is exemplified in the Cosh and Iron Creek areas, where the previous harvesting of small single-sized blocks has fragmented the landscape into a checkerboard. Suitable harvest / silviculture regimes should emulate the large-scale low-retention fire events in the uplands and the small-scale gap dynamics evident in parts of the subalpine and the lowlands.

A **Variable Retention Harvest System** provides the options needed for ensuring that forest practices are compatible with the ecology of the site and stand, rather than imposing a mismatch of blanket rules.

> "*Variable retention recognizes that natural disturbances such as fire, wind or disease always leave some standing 'structure" from the original forest. This structure plays an important role in forest ecosystem function and biological diversity"* (Beese, 1998).

Variable Retention, correctly classified as a Harvest System by Franklin *et al.* (1997), can be superimposed on any of the classical silviculture systems to achieve both crop regeneration and multiple resource objectives that require various structural elements to be left behind. Three major purposes of using a Variable Retention System are as follows:

- '**Life boating**' - providing localized refugia for species before the remainder of the stand is fully re-established
- '**Enriching** - providing habitat elements that would not otherwise be present in the new stand.
- '**Maintaining connectivity**' - providing stand-level connectivity in conjunction with landscape-level corridors or forest ecosystem networks (FENs)

From these perspectives, cutblock size and silviculture system essentially become non-issues because they are dictated by the magnitude of disturbance, the tree species and the

structure of the stand, and other characteristics of the site. With emphasis being placed on **what to retain and where to retain it,** flexible retention limits can be provided relative to the needs of the resources being managed. A silviculture forester would therefore prescribe the amount of retention (zero to 100%) and its spatial distribution (aggregated or dispersed) prior to harvest, along with a compatible 'regeneration method'. Using first-hand pre-harvest information, the harvesting and silviculture are custom-fitted to the resource issues that have been identified, the site and stand characteristics that are encountered, and the silvics involved.

An example would be the choice of a Group Selection silviculture system that mimics small windthrow events, producing 80% aggregated retention in a 20 ha lowland spruce stand to maintain thermal cover in moose winter habitat. Another example would be the use of a Clearcut-with-Reserves silviculture system to mimic a large fire event with small skips, producing 10% retention dispersed over a 500 ha even-aged upland pine stand. In both cases, the amount and pattern of retention prescribed is appropriate for the site, the resource issue involved (moose cover), and the natural disturbance history.

Variable Retention Harvesting as a stand-level management tool cannot be practiced in isolation, but when combined with landscape zonation and management of the forest age-profile, the use of variable retention has the flexibility to sustain both timber harvesting and non-timber values over time.

5.3 Harvest Unit Selection and Road Development

Reconnaissance of the site, the forest inventory datafile, and the resource issues known at the site were used to select candidate stands for potential harvesting. A synopsis was made of the issues that might be encountered or considered in the layout and harvesting of the stand concerned.

Criteria for the selection of harvest blocks were:

- Principles and objectives of the landscape-level plan
- Silviculture and harvesting strategies
- Probable site and stand ecological attributes (soils, v-type, structure, etc)
- Potential non-timber concerns
- Forest inventory (species group, age, volume, etc.)
- Access potential and stand operability
- Timber merchantability and quality
- Forest health

Once the candidate blocks were identified, main and spur roads were proposed for access. At each of the four planning units, all potential access routes were flown and the most feasible was chosen, using the following criteria:

- Optimum total amount of road, balancing cost and Plan objectives
- Forest health and protection strategies

- Other resources that could be affected by access development
- Minimal amount of road in or near riparian areas
- Minimal number of crossings of streams, wetlands, and wildlife travel routes
- Grades and curves that enable safe log hauling
- Minimal adverse grades and 'back hauls'
- Provision of seasonal spur roads but all-weather mainline access
- Minimal amount of road on wet ground (subhygric or wetter)

5.4 Stand-level Operational Guidelines

With regard to the numerous resource values identified at landscape level, this section provides a synopsis of the stand-level strategies used in the Integrated Resource Management Zone / Differentiated - to ensure that timber harvesting contributes to, or is at least compatible with, the landscape goals.

5.4.1 Pre-Harvest Assessments

Successful application of the following guidelines will require rigorous **Pre-Harvest Assessments** conducted by a forester with input from other relevant resource professionals. The two most important reasons for these assessments are:

- If the natural processes guiding landscape-level management are manifested by site- and stand-specific ecology, then accurate assessment of that ecology will allow selection of techniques that yield predictable results. This gives assurance that the intended objectives will be met.

- If the resolution of landscape-level planning is such that critical or special resource features may be overlooked, site-level assessments can be used to adjust stand management to account for those resources on a site-specific basis.

Pre-Harvest Assessments provide the information required for this. The strategies for dealing with issues encountered at stand level are as follows:

Forest Health

Forest pests can be managed using some basic forest health practices:

- Having a professional forester evaluate any forest health concerns in each stand before harvest, to ensure that a silviculture prescription includes appropriate site-specific remedies.
- Ensuring that the sites are reforested with the species (natural and/or planted stock) found in the pre-harvest stand, or an ecologically suitable alternative if the stand has pest or disease concerns that may impact on the regeneration.
- Monitoring the area for forest health issues arising as time proceeds, and addressing them with remedial action.

Fire control:

- Prescribed burning of harvest areas and/or accumulations of slash as conditions warrant.
- Ensuring that the slash is well distributed across the harvest area if site conditions restrict burning as a means of disposal.
- Where stand and site conditions warrant, targeting high-risk stands for 'fire-proofing' via density control or harvesting actions.
- Use of planting to minimize time to green-up on harvested areas.
- Develop a comprehensive fire preparedness plan for all active operating areas.

Windthrow:

- Have professional foresters or technicians undertake windthrow hazard assessments for reserves within or adjacent to harvest areas, and adjust the silviculture prescription for the harvest unit appropriately
- Feather the edges of harvest units where dense stand edges will be encountered, or avoid opening up stands with trees of large ratios of height to diameter.
- Place harvest boundaries at topographic features to protect stand edges from the prevailing winds.
- Utilize natural stand edges as harvest area boundaries
- Avoid locating unprotected boundaries on wet soils where tree rooting is shallow
- Manage post-harvest stand densities for wind-firmness in conjunction with other stand-structure objectives

Cultural Heritage

Sites of particular cultural, archaeological, or historical significance are often difficult to address at a landscape level, due to their highly localized nature. Such sites may include human burial places, heritage trails, abandoned cabins, or culturally modified individual trees, and are most readily dealt with at the pre-harvest assessment stage. It is important for assessment personnel to familiarize themselves with potential heritage sites, especially with regard to cultural attributes of the Kaska Nation. If any such sites are identified in the field, the Kaska must be consulted to establish the significance of the site and to determine the most feasible method of preservation.

Traplines and Trappers' Cabins

These were addressed in general terms at the landscape level, but some trapline cabins, caches, or trails were most likely overlooked. If a trapline is found to exist near a proposed harvest site, the owner should be consulted and a solution devised for maintaining the viability of the line and protecting the trails etc. that are associated with it. This may necessitate changes to some harvest units. For trapline cabins, a reserve should be maintained as per the *Timber Harvest Planning and Operating Guidebook*.

Mining Claims

Recent mining activity has occurred within or near some of the planning units, and existing mineral claims have been acknowledged in this Plan. Where harvesting and road construction is proposed within mineral claims, the owner of the claim must be notified before the work begins. In general, timber harvesting and mining tend to be at least compatible, and sometimes mutually beneficial, through proper consultation and planning. An example is the sharing of access rather than building duplicate roads.

Wildlife

Key travel corridors and habitat for moose and caribou are included in the FEN. In the adjacent IRMZ-D, however, site-specific assessments will be required to ensure that harvest units do not compromise other habitats, giving special attention to species that are listed as endangered or threatened (Appendix 3). The pre-harvest assessment should look for features such as:

- Well-used trails: Assess terrain features such as ridges, draws, and watercourses for evidence of animal trails. Ensure travel will be unobstructed when harvesting and silviculture have ended. Use leave-trees or retention patches to provide visual screening.

- Mineral licks: Maintain a reserve zone around the lick and the trail network leading to it. Reserve size could range from 1 to 5 hectares, depending on the amount of wildlife use.

- Places with abundant terrestrial lichens: If adjacent to FENs or caribou travel corridors, terrestrial lichen sites should be considered for exclusion from the harvested area, or logged in a manner that protects the lichen. Commercial thinning over a thick snowpack is one such method.

- Stands of deciduous trees: Leave wind-firm groups and protect snags (especially of aspen and birch) as nest sites for birds and den sites for furbearers such as marten and fisher.

- Coarse woody debris: Slash should be dispersed throughout the harvested block or piled in small accumulations as small mammal habitat, but must not be allowed to impede natural drainage courses or wildlife trails.

- 'Wildlife trees': Raptor nest trees should be enclosed within a wind-firm wildlife tree patch, and harvesting in the near vicinity should not overlap with the nesting period.

If a particular wildlife-related feature is suspected of being highly important (or conversely, value uncertain), a professional biologist should be consulted.

Riparian Features

Waterbodies not already noted in this Plan should be identified during stand-level assessments. Any definable stream [11] should be considered fish-bearing unless surveyed to the contrary by a professional fisheries biologist. The *Timber Harvest Planning and Operating Guidebook* prescribes widths for stream management zones and reserves. These should be considered minimum values and should be increased at sites where risks to wind-firmness, slope stability, or wildlife habitat will call for wider zones. Regardless of whether wet or dry at the time, seasonal drainages and seeps should also be kept intact, to maintain the entire drainage system of the area.

Terrain Stability

For reasons of operability and safety, continuous slopes of more than 45% have been netted-out of the Integrated Resource Management Zone in this Plan. However, intermittent slopes that also exceed 45% should be excluded likewise if safety or soil integrity are judged to be at risk. Apart from operability and safety, the pre-harvest assessment must also identify areas of potentially unstable ground anywhere within or adjoining the planned harvest area. Slopes of as little as 15% can sometimes become unstable if predisposed by the underlying geology. Where potential instability is encountered, a professional geoscientist or engineer should assess the site and determine how best to deal with it.

Visual Quality

Known viewpoints have been examined and draft visual quality objectives have been established for each of the four planning units. A percentage of retention for visual purposes has been suggested for each proposed cutblock (see Appendix 1). If visual quality is in question at a particular block, digital terrain models can be used to predict the visual impact of the management that is proposed for that block. Changes in block configuration, harvest method, or silviculture system to satisfy visual concerns must also consider the impacts on other resources.

Stand-level Biodiversity

Each of the harvest units listed in Appendix 1 has been given a target percentage of retention. This can either be met by choice of silviculture system, or by choosing particular site features or stand structural attributes to be preserved. Candidates for retention often coincide with objectives for wildlife or other non-timber values. Inoperable sites, unstable terrain, wet ground, and riparian sites can all contribute to the target percentage. Aggregating a variety of such retentions can help to produce the type of irregular configuration which the Natural Disturbance Principle seeks to mimic. Connectivity can also be increased. Retention patches that satisfy the 250 meter 'dash-distance' requirement (*Timber Harvest Planning and Operating Guidebook*) should be

[11] Criteria for this vary among jurisdictions but typically aim to distinguish between permanent watercourses and ephemeral water flows.

established wherever wildlife values are high and suitable stand structure exists. However, the use of retention merely to satisfy a rule is contrary to the idea of matching stand management to site conditions (Section 2). Everything left on a harvest site should serve an ecological, cultural, or operational purpose, and every site will differ in these respects.

6.0 Timber Harvest Summary, and Effects on the Forest Age and Patch-Size Profile

6.1 Cutblock Summaries and Economics

Appendix 1 gives a listing of candidate blocks for each planning unit, with their proposed sizes, levels of retention, timber volumes, and non-timber values. This information is to be refined by the Pre-harvest Assessment of each block.

Appendix 2 gives estimates of the costs of harvesting, road construction, and silviculture at various operational groups of blocks. These estimates are of course provisional until the blocks and the road layout are finalized.

6.2 Pre- and Post-Harvest Comparison of Stand Age and Size

In order to mimic an area's natural disturbance history (Section 2), the ideal timber harvest plan would create the same relative number of small, medium, and large cutblocks as the size-distribution of patches in the landscape beforehand. The same would apply to the harvest schedule, so as to perpetuate the forest age profile. Such a plan would assume that the pre-harvest landscape provides a satisfactory template for the purpose.

For it to do so, the existing patch-size and age-distributions would have to be potentially self-sustaining, and their spatial arrangement would have to lend itself to the placing and timing of blocks of the required numbers, sizes, and harvest dates. The blocks would also have to be merchantable and operable, and not conflict with the maintenance of other resource values.

This is a demanding set of requirements, and no planning unit is likely to meet them unless it is large enough for choices to be made over cutblock location and size in particular. However, a theoretically ideal plan may not be possible, or even desirable, if the landscape itself is not already in a stable self-sustaining state. Stability requires that the natural disturbance regime be consistent enough for fluctuations in the forest age profile to stay within certain limits (Footnote 2). This in turn requires the timing, size, and spacing of events to be predictable rather than random or erratic. However, the fire regime in the boreal forest appears to be erratic in timing and random in spatial occurrence – enough so that a stable state may be unattainable (Footnote 4). Thus, the objective of 'ideal' fire mimicry may be illusory. Under these circumstances, the forest manager has two options: (i) try to limit fire incidence and size; and (ii) replace the

erratic natural regime with an orderly progression of fire-substitutes capable of achieving a stable size and age profile. This would not merely tolerate departures from the existing profile, it would *require* them. During the course of the harvest cycle, patch sizes and ages should retain the same *range* of variation as the natural regime, but should alter the shape of their *frequency-distributions*.

The present plan offers a start toward this aim. Table 5 shows the forest age-profile for each planning area before and after the proposed harvest plan, and the relative changes among the 'young', 'immature', 'mature', and 'old growth' age-classes. The predominance of mature forest and the shortages of young forest are both reduced at all areas except Watson Lake where constraints on the plan restrict the amount of potential harvesting. The large percentage changes at West Rancheria and the two Ross River sub-units are due to the limited size of these planning areas, in which the relatively small amount of harvesting has a disproportionate effect. [12]

Table 5

CHANGE IN FOREST COVER AGE-PROFILE, Pre- versus Post-harvest
Total hectares per age-group, all forest cover-types combined

	NSR - 30 yrs (ha)			31-79 yrs (ha)			80-130 yrs (ha)			>130 yrs (ha)		
PLANNING UNIT	Pre	Post	%change	Pre	Post	%change	Pre	Post	%change	Pre	Post	%change
East Hyland	41433	50533	22%	13295	12928	-2.8%	42759	34025	-20%	495	248	-50.0%
Rancheria	467	3426	634%	378	367	-2.9%	7611	4674	-39%	422	422	0.0%
Watson Lake	3230	4542	41%	2860	2857	-0.1%	26852	25543	-5%	644	644	0.0%
Buttle Creek	75	1100	1365%	840	814	-3.1%	5779	4780	-17%	502	502	-0.1%
Coffee Lake	90	379	322%	261	261	0.0%	681	445	-35%	151	151	0.0%

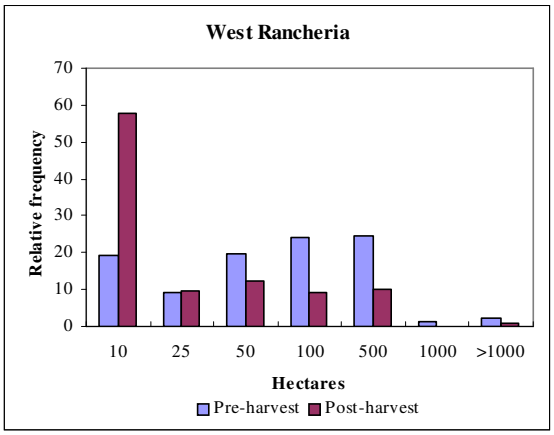
Figure 2 shows the patch-size profile of each planning unit, and the percentage change after logging takes place. If most patches represent fire events, and fire size has been random (p.7), small to mid-sized patches should predominate [13]. In fact they do so at all planning units except West Rancheria. Large patches (>500 ha) are scarce at all areas except (relatively) the Coffee Lake sub-unit. However, because the Coffee Lake sub-unit is so small, the presence of just a few large patches is enough to inflate their relative importance. The small size of West Rancheria too may account for the difference in patch-size distribution there.

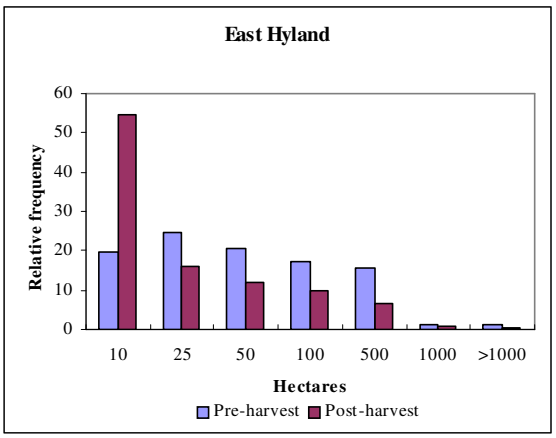
At all planning units except Watson Lake, the harvest plan will shift the size distribution toward smaller patches, at the expense of patches in the 50-500 ha range. This should be acceptable if the aim is to replicate a random pattern of fire events. At Watson Lake, the profile shows little change, again because the potential harvest options are constrained. At all units, however, more large patches (>100 ha) should be added in future years so that the mid to larger range of sizes is maintained. Some of this could be achieved by infill harvesting to amalgamate small blocks harvested earlier. The sizes of blocks and the harvest schedule in future years will be central topics for maintaining both a sustainable timber yield and the biodiversity of each planning unit.

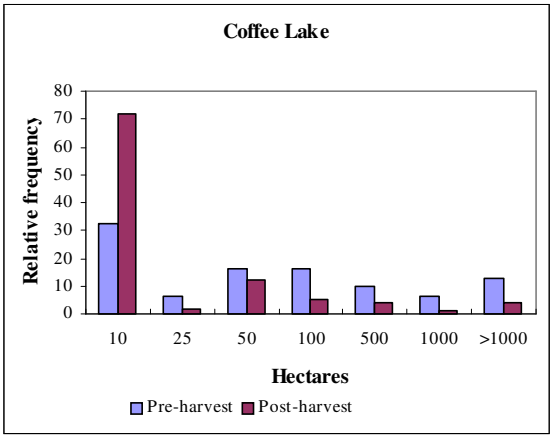
[12] See Section 7 for a recommendation to increase planning unit sizes.

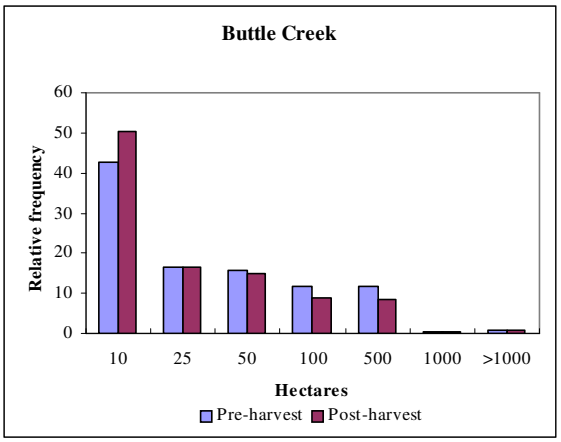
[13] Since fires grow in extent incrementally.

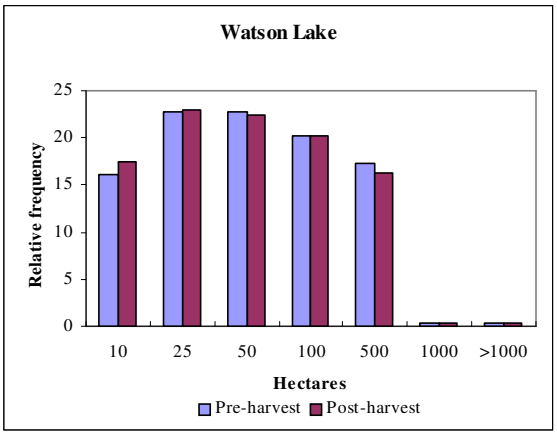
Figure 2. Relative frequency-distributions of forest patch size, pre- and post-harvest











7.0 Recommendations for Implementing this Plan

During preparation of this plan, several issues were identified that may have a direct bearing on the plan's success or failure. Relevant authorities may wish to review the issues listed below, and develop a policy or strategy for each:

- It is recommended that the four landscape units be developed for management as soon as possible.[14] For example, the Watson Lake unit and adjoining area is covered at present by several poorly linked (often overlapping) plans that do not reflect the area's natural disturbance history. As a consequence, prime winter range for the Little Rancheria caribou herd is at risk of being lost, because it is currently defined only by its generically mapped location, not by the forest attributes that the caribou actually use. Some timber values in the unit may be needlessly excluded from harvest for the same reason. The unit is at risk of becoming irreparably fragmented and its values unsustainable unless a unified and integrated plan is put in place.

- As a great deal of weight is placed on gathering stand-level detail for each potential harvest area, a Pre-Harvest Assessment and Pre-Harvest Silviculture Prescription policy should be developed to guide the collection of site and stand information with sufficient detail to develop stand-level objectives, that are consistent with the landscape-level goals of the plan. This information must also guide the operational development, harvesting, and post-harvest silviculture of each planning unit, and could take the place of an Environmental Assessment at each harvest area.

- To facilitate the stand-level fieldwork, cross-training between Kaska Nation personnel and operational planning foresters is recommended. This would ensure that the foresters recognize and understand the cultural values at each site, and that the Kaska personnel gain expertise in the process of making an operational forest development plan.

- To facilitate orderly development of the timber resource, a strategy for the financing and building the main haul roads is required. Road criteria should be developed, and a road management policy established with both a pre-harvest and a post-harvest timeframe.

- As substantial negative impacts can occur during road construction, timber harvesting and silviculture work standards should be established for each of these activities, relative to the landscape and stand-level objectives of the overall management plan. A compliance and enforcement strategy may also be required in relation to any standards that are set.

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[14] During presentation of the draft plan at Watson Lake in July 2003, new information was tabled regarding a potential land claim covering the northern portion of the East Hyland planning unit (Lost and Hyland operating areas). Until this matter is resolved, operational development may have to be deferred in the areas concerned.

- For this plan to succeed, the areas concerned must remain fire-free or substantially so. Establishing a capacity for rapid response to outbreaks should be a strategic and tactical priority.

- As post-harvest reforestation requirements will increase under a fully implemented plan, a strategy is needed for collecting silviculture revenues and developing a silviculture policy. This could involve the establishment of an expanded Yukon reforestation program and silviculture industry to ensure that the reforestation objectives can be met.

- As all good forest planning depends on updating information and modifying strategies and techniques as better information becomes available, a resource monitoring and audit program are required. These are prerequisites for both adaptive management and sustainable development.

- In conjunction with forest planning, an applied research program would be advisable to deal with problems arising. The research should be closely tailored to operational management priorities. For cost-efficiency, and to provide usable results as early as possible, the program should focus in the first instance on *adapting existing knowledge* to Yukon-specific conditions and *field-testing it in operational circumstances*, rather than undertaking new basic research. As it is generally costly and slow to produce useable results, basic research should be confined to major knowledge gaps that cannot be filled by applying knowledge available from elsewhere.

- It is recommended that the landscape units for planning forest management in the Yukon should be made larger. As suggested by Kimmins (2003): *"In very large landscapes – one or more orders of magnitude larger than the average size of the mean disturbance patch or disturbance event (an aggregation of patches) – the overall character of the mosaic may be fairly constant over time."* Given the average fire event of about 1,100 ha in the Yukon, Kimmins' assertion implies that the *smallest* landscape unit on which to manage a long-term sustainable harvest would be at least 110, 000 ha. Of the four landscape units included in the present plan, only East Hyland approaches this minimum size.

- It is recommended that the principles and strategy of approach that have been applied to these four initial planning units be applied to all Yukon FMUs so that an updated TSR and sustainable AAC can be determined for the entire Territory.

Sustainable resource management is an evolving process, still at an early stage of development. The final recommendation of this report is that all who are involved with the present plan should be willing to accept changes in it as further information accumulates. This is the essence of the Adaptive Management principle.

Glossary of Terms

Advanced regeneration (see also *Green-up* and *Regeneration delay*) – Refers to any non-merchantable trees left on an area to provide future timber production. These trees must meet various quality standards in order to be considered part of the potential future crop.

Age (and **patch size) distributions** – For age: the frequencies (numbers) of forest stands of various age-classes, usually grouped in 10 or 20-year intervals. For patch size: the numbers of forest stands of various size-groups.

Area (see also *Site*) – Portion of the landscape, larger than a site, and with non-specific boundaries.

Biodiversity – The abundance and variety of organisms in an ecosystem or a geographic area. Exists at many unit-scales from the genetic level to the entire biosphere. Measured formally in terms of the *number of different units* and the *relative abundance* of each. In common usage, the term usually just means 'number of species' in the area concerned.

Ecosystem – Originally an abstract term referring to the set of functional relationships between organisms and their abiotic environment, and among the organisms themselves. In natural resource management, the term is now commonly applied to actual units of land or water in which named organisms exist and in which the functional relationships occur. These units are defined by commonalities within them (such as a single soil type, species assemblage, and microclimatic regime).

Edaphic (also **mesic** and **subhygric**) – Relates to site productivity, which is determined by the soil moisture and nutrient status of the site. *Mesic* and *subhygric* refer to soil moisture status - mesic being of average soil moisture for any given climate, and subhygric being of slightly wetter than average soil moisture for any given climate.

Fire Mimicry – An attempt to emulate the results of a natural wildfire regime by artificial means, usually logging, to produce a similar array of forest patch ages and sizes in space and time.

Forest Ecosystem Network (FEN) – An area of land, currently in a natural state, intended to serve the functional purposes of connectivity and ecosystem representation. On a landscape scale, a FEN should connect various land units such as protected areas (reserves), ecologically sensitive areas, key habitats, rare ecosystems, riparian zones, and wildlife travel routes. In the short term, a FEN is a no-harvest zone, and parts of it might never be harvested at any time. In the longer term, however, some parts of it could be harvested, replacing these by other land units, including previously logged or burned-over areas if or when their redevelopment attains sufficient maturity.

Forest stand (see also *Site* and *Area*) – Any area of forest that is being managed as a single unit on an operational basis. Forest stands are usually tens to hundreds of hectares in size.

Green-up (see also *Regeneration delay* and *Not Satisfactorily Restocked*) – Refers to a cutblock containing a stand of trees that have attained a height and density requirement specified in a landscape-level plan.

Landscape Unit – An area sharing similarities of terrain, local climate, hydrology, vegetation types, and general ecology, with boundaries defined by major topographic features (typically heights of land) which separate the unit from others with different attributes.

Leading species – The dominant tree species in a stand, measured as a percentage of the total tree canopy cover in the stand.

Merchantability of a stand is defined by its net volume of merchantable trees per hectare. The merchantability of individual trees is defined by their diameters and proportions of sound wood. Any tree greater than 13.6 cm. in diameter, with over 50% sound wood in the bole, is considered merchantable. For the purposes of this report, all stands containing more than 100 cubic metres per hectare were classed as merchantable.

Mixedwood – A forested stand that contains a mixture of deciduous and conifer species, with neither species comprising more than 80% of the total canopy cover. Mixedwood stands can be either conifer-leading or deciduous-leading. (see *Leading Species*).

Natural Disturbance Zones (NDZ) – Portions of the landscape where stand-initiating and stand-maintaining events such as wildfires or pest outbreaks are similar in type, frequency, and size. The NDZs of the four planning units in this report are as defined in the *Forest Resources Timber Harvest Planning and Operating Guidebook* (Appendix II, pages 45-48).

Not Satisfactorily Restocked (NSR) (See also Regeneration delay and Green-up) - Productive forest land that has been denuded (naturally or otherwise) and has partly or completely failed to regenerate new tree cover to a specified density, distribution, and quality of desired tree species.

Old growth – Any forest stand older than 130 years at any of the planning units. (This is a practical definition for the purposes of this project. Elsewhere the age may be older or younger, depending on the natural disturbance regime). More generally the term refers to forest at a final state of ecological development, with a stable age-distribution and a stable species composition.

Operability – Refers to the harvest potential of a site via readily available harvesting technology. Factors that influence the operability of a stand include slope steepness, slope stability, accessibility, terrain roughness, etc. (eg, all slopes > 45% are considered inoperable).

Operational (as distinct from *Strategic*) is a term used to describe the tactics for translating landscape-level strategies into stand-level procedures so that these strategies can be put into practice. For example, a strategy to reduce the visual impact of a block may be to limit the proportion of visual landscape that may appear visually altered. An operational procedure to achieve this would be to retain dispersed retention of sufficient density (on a harvest area) such that the tree canopy appears undisturbed.

Operating area – Part of a planning unit comprising forest stands that can be harvested as a group served by (usually) a single access route (one main road with branches to each block)

Planning unit – An area of land defined for the purpose of a timber harvest plan or a *total resource* plan covering non-timber as well as timber resources. (See also *Landscape Unit*)

Regeneration delay – The length of time between the completion of harvesting and the point at which the site is said to be fully re-stocked (ie, an immature stand has been established). For

natural regeneration, this can be a considerable length of time (tens of years). For artificial reforestation the period is usually shorter (1-5 years).

Reserve – Generic term for a unit of land set aside for selected purposes and/or excluded from certain uses.

Resource Management Zones: Portions of landscape chosen to be managed for specified resource objectives. For this plan there are four such Resource Management Zones:

- **IRMZ-U –** The Integrated Resource Management Zone / Undifferentiated comprises those portions of the landscape which have been burned by wildfire during the past 30 years and have not been inventoried sufficiently to classify them into forest stand types. In the future, these areas must be inventoried and assigned to one of the other three zones according to their best end-use.
- **IRMZ-D –** The Integrated Resource Management Zone / Differentiated comprises those portions of the harvestable landscape that have forest stands > 30 years old, classified into specific stand types.
- **Alternate Use Zone –** Comprises those portions of the Planning Unit that can not be used for forest resource development. Such areas include private land, Yukon land parcels, Federal land parcels, town lands, permanent sample plots, parks, etc.
- **FENs** (see definition above)

Riparian – Refers to land adjoining rivers, streams, wetlands, and lakes that is directly influenced by the ecology of those waterbodies. For this report, minimum Riparian Management Area widths are as defined in the *Forest Resources Timber Harvest Planning and Operating Guidebook,* pages 8-12.

Riverine – A natural disturbance type (see Natural Disturbance Zones) occurring next to large watercourses, and having stand-initiating events directly related to events in those watercourses, such as periodic flooding.

Seral stage – A stage or phase in a sequence of ecosystem progression from colonization to maturity (see *Old Growth*).

Silviculture – The art and science of regenerating and growing a stand of trees for the purpose of timber production.

Silvics – The study of the life history, requirements, and general characteristics of forest trees and stands, in relation to the environment and to the practice of silviculture.

Silviculture System (as distinct from Harvest Method) – A defined methodology for harvesting and re-growing a forest stand for further timber production. There are only five classic silviculture systems. These are selection, shelterwood, coppice, seed tree, and clearcut (Weetman 1996). Alternatively, a **harvest method** is the process of removing trees from a site while retaining certain structural attributes for some other purpose (eg, strip cutting to retain visual screening from a scenic viewpoint).

Site (as distinct from Area) – A specific location within a piece of land.

Strategy and **strategic** (as opposed to tactics and tactical) – Strategy refers to a conceptual plan of approach for achieving a chosen objective, typically also expressed in abstract terms and

accompanied (desirably) by a tangible goal or set of goals by which success can be measured. **Tactics** and **tactical** refer to the ways and means by which the strategy is implemented and the objective pursued (see *Operational*). In this project, the strategy is integrated resource management, and the objective is sustainability.

Sustainability – The ability to maintain a stable existence, composition, productive capacity, or value (economic, cultural, or aesthetic) over an indefinite timescale.

Total resource plan: - A management plan for all of the resources within a planning unit, other than (usually) minerals, water, and energy. May also be termed an *Integrated* Resource Plan when it seeks to manage two or more resources in a mutually compatible way on the same land unit.

Variable Retention – A harvest method which retains various structural attributes on a harvest area, to provide for objectives other than timber production.

Wildlife 'sign' – Indirect evidence of animal presence, such as trails, feces, browsed vegetation, nests, etc.

REFERENCES

Anon. *Wild Species 2000: The general status of species in Canada. http://www.wildspecies.ca/wildspecies2000/en/*

Adamczewski et al., 2003. *Interim Wood Supply Committee Values Tables (in progress).*

Beese, W. J.,1998. *The Forest Project: charting a new course, ABCPF Forum Vol. 5, Issue 5 Sept/October 1998.*

C. Sparks Consulting, 2002. *5-Year Fire Abatement Working Plan for Wildfire Mitigation in and around Watson Lake.*

Delong, C. S, Tanner, D. 1996. *Managing the pattern of forest harvest: Lessons from Wildfire, Biodiversity and Conservation No.5, pp 1191-1205.*

Franklin, J. F., Berg, D. R., Thornburgh, and Tappenier, J. C., 1997. *Alternative Silvicultural Approaches to Timber Harvesting: Variable Retention Systems. pp 111-139 Creating Forests for the 21st Century: The Science of Ecosystem Management.*

Kaska Forest Resources Stewardship Council, 2003. *KFRSC Procedures Document.*

Kimmins, J. P. 2003. *Old-growth forest: An ancient and stable sylvan equilibrium, or a relatively transitory ecosystem condition that offers people a visual and emotional feast? Answer – it depends, The Forest Chronicle, Vol. 79, No. 3, May/June2003, pp 429-439..*

Lance, A.N. and Mills, B. 1996. *Attributes of woodland caribou migration habitat in west-central British Columbia.* Rangifer, Special Issue 6; 355-364.

Li, C. and Barclay, H.J . 2001. *Fire disturbance patterns and forest age structure. Natural Resource Modeling 14; 495-521.*

Weetman, G. F., 1996. *Are European Silvicultural Systems and Precedents Useful for British Columbia Silviculture Prescriptions. UBC Faculty of Forestry. FRDA Report 239.*

Yukon Department of Renewable Resources, 1999. *Yukon State Of The Environment Report 1999.*

Yukon Energy, Mines and Resources, 2003. *Territorial Lands (Yukon) Act, Timber Regulations.*

Yukon Forest Resources, Forest Management Branch, 1999. *Timber Harvest Planning and Operating Guidebook.*

Yukon Forest Resources, Forest Management Branch, 2000. *Final Resource Report East Hyland Planning Area.*

Yukon Forest Resources, Forest Management Branch, 2001. *Final Resource Report Watson Creek Harvest Planning Area.*

Appendix 1. Harvest Block Summary

Ross River

Block	Area Hectares	Leading Species	Volume per ha.	Gross Volume	% Ret	Net Volume	Retention Type	NDZ	Harv/Silv System	Harvest Season	Potential Resource Issues					
											Wildlife	Visual	Terrain	Riparian	Cultural	Mining
BUT 1	176	SW	180	31,734	50	15,867	D	U/L	VR-EVEN	W		Y	Y	Y		
BUT 2	48	SW	150	7,215	20	5,772	A	U	VR-EVEN	W		Y				
BUT 3	40	SW	150	6,045	20	4,836	A	U	VR-EVEN	W		Y	Y			
BUT 4	60	SW	180	10,764	50	5,382	A/D	U	VR-EVEN	W		Y		Y		
BUT 5	19	SW	180	3,330	10	2,997	A	U	VR-EVEN	W		Y			Y	
BUT 6	34	SW	180	6,048	50	3,024	A/D	U	VR-EVEN	W		Y				
BUT 7	35	SW	120	4,188	50	2,094	A/D	U	VR-EVEN	W				Y	Y	
BUT 8	45	SW	120	5,352	50	2,676	A/D	U	VR-EVEN	W						
BUT 9	39	SW	120	4,668	50	2,334	A/D	U	VR-EVEN	W		Y	Y	Y	Y	
BUT 10	152	SW/SB	120	18,228	40	10,937	A/D	U	VR-EVEN	W		Y			Y	
BUT 11	112	SW	275	30,883	50	15,441	A/D	L	VR-EVEN	W	Mo	Y		Y	Y	
BUT 12	41	SW	110	4,488	10	4,039	A/D	U	VR-EVEN	W			Y			
BUT 13	58	SW	150	8,655	10	7,790	A	U	VR-EVEN	W			Y	Y		
BUT 14	25	SW	120	3,024	0	3,024		U/L	VR-EVEN	W			Y			
BUT 15	142	SW	180	25,596	30	17,917	A	U	VR-EVEN	W				Y		
COF 1	51	SW	130	6,656	50	3,328	D	U/L	VR-EVEN	W		Y		Y	Y	
COF 2	86	SW	130	11,180	50	5,590	D	U/L	VR-EVEN	W		Y			Y	
COF 3	32	SW	180	5,670	50	2,835	D	U/L	VR-EVEN	W		Y				
COF 4	40	SW	130	5,187	50	2,594	D	U/L	VR-EVEN	W		Y		Y		
COF 5	44	SW	130	5,720	50	2,860	D	U/L	VR-EVEN	W		Y				
COF 6	37	SW	130	4,797	50	2,399	D	U	VR-EVEN	W		Y		Y		

Watson Lake

Block	Area Hectare	Leading Specie	Volum per	Gross Volum	% Ret	Net Volum	Retentio Type	NDZ	Harv/Sil Syste	Harves Seaso	Potential Resource					
											Wildlif	Visua	Terrai	Riparia	Cultura	Minin
W1	120	SW/P	190	22,87	30	16,01	A/D	U	VR-			Y		Y	Y	
W2	45	P/SB	150	6,690	10	6,021	A/D	U	VR-						Y	
W3	91	P/SB	150	13,62	20	10,89	A/D	U	VR-						Y	
W4	60	P	150	8,925	20	7,140	A/D	U	VR-			Y			Y	
W5	89	P	150	13,39	10	12,05	A/D	U	VR-			Y			Y	
W6	99	P	150	14,80	10	13,32	A/D	U	VR-							
W7	114	P	150	17,13	20	13,70	A/D	U	VR-	W			Y	Y	Y	
W8	483	P/SW	200	96,56	30	67,59	A/D	U	VR-	W						
W9	61	P	120	7,272	0	7,272		U	VR-	W	C					
W10	83	SW	300	24,99	50	12,49	A/D	L	VR-	W	Mo	Y		Y		
W11	20	P	100	2,040	0	2,040		U	VR-	W	C	Y		Y		
W12	104	P/SB	180	18,68	10	16,81	A/D	U	VR-	W						
W13	46	P	180	8,298	10	7,468	A/D	U	VR-	W						

West Rancheria

Block	Area Hectares	Leading Species	Volume per ha.	Gross Volume	% Ret	Net Volume	Retention Type	NDZ	Harv/Silv System	Harvest Season	Potential Resource Issues					
											Wildlife	Visual	Terrain	Riparian	Cultural	Mining
R1	21	SB / P	125	2,563	40	1,538	A / D	U	VR-EVEN		C	Y		Y		
R2	289	P / SB	150	43,350	40	26,010	A / D	U	VR-EVEN			Y		Y	Y	
R3	32	P / SW	120	3,888	70	1,166	D	SA	VR-EVEN			Y				
R4	408	P / SW	120	48,972	50	24,486	A / D	U	VR-EVEN			Y			Y	
R5	27	P	150	4,095		4,095		U	VR-EVEN		Mo				Y	
R6	56	P	150	8,340	10	7,506	A	U	VR-EVEN						Y	
R7	127	P	150	19,005	10	17,105	A	U	VR-EVEN							
R8	44	P / SW	120	5,256	10	4,730	A / D	U	VR-EVEN					Y		
R9	369	P	150	55,365	30	38,756	A / D	U	VR-EVEN			Y		Y		
R10	68	P	150	10,155	10	9,140	A	U	VR-EVEN	W				Y	Y	
R11	25	P / SB	150	3,810		3,810		U	VR-EVEN	W				Y		
R12	70	SW / P	120	8,376	10	7,538	A / D	U	VR-EVEN							Y
R13	16	SW / P	120	1,884		1,884		U	VR-EVEN					Y		
R14	198	P / SW	120	23,712	30	16,598	A / D	U	VR-EVEN				Y	Y		
R15	91	SW / P	120	10,872	20	8,698	A / D	U	VR-EVEN				Y	Y		
R16	36	P / SB	150	5,415	10	4,874	A / D	U	VR-EVEN	W	C			Y		
R17	77	P / SB	150	11,535	30	8,075	A / D	U	VR-EVEN	W						
R18	258	SB / P	125	32,250	30	22,575	A / D	U	VR-EVEN		C	Y		Y		
R19	154	SB / P	125	19,250	20	15,400	A / D	U	VR-EVEN		C		Y	Y		
R20	76	SW / P	120	9,132	40	5,479	A / D	SA	VR-EVEN					Y		
R21	146	SB / P	125	18,263	20	14,610	A / D	U	VR-EVEN					Y		
R22	58	P / SB	150	8,625	20	6,900	A / D	U	VR-EVEN					Y		
R23	66	SB / P	125	8,250	10	7,425	A / D	U	VR-EVEN		Mo		Y	Y		
R24	97	SW / P	120	11,664	10	10,498	A / D	U	VR-EVEN					Y		
R25	24	SB / P	125	2,938		2,938		U	VR-EVEN					Y		
R26	43	SB / P	125	5,425	10	4,883	A / D	U	VR-EVEN					Y		
R27	148	SW / P	120	17,784	20	14,227	A / D	U-SA	VR-EVEN				Y	Y		Y

East Hyland – *Irons* operating area

Block	Gross Area Hectares	Net Area Hectares	Leading Species	Volume per ha.	Gross Volume	% Ret	Net Volume	Retention Type	NDZ	Harv/Sliv System	Harvest Season	Potential Resource Issues					
												Wildlife	Visual	Terrain	Riparian	Cultural	Mining
I1	110	92	P/Sw	250	22,954	20	18,363	A/D	U	VR-EVEN			Y				
I2	57	53	Sw/P	250	13,370	30	9,359	A/D	U	VR-EVEN		Mb	Y		Y		
I3	33	32	P/Sw	250	7,977	10	7,179	A	U	VR-EVEN			Y				
I4	46	46	P/Sw	250	11,399	20	9,120	A/D	U	VR-EVEN		Mb			Y		
I5	90	90	P/Sw	250	22,494	30	15,746	A/D	U	VR-EVEN		Mb			Y		

East Hyland – *Boundary* operating area

Block	Gross Area Hectares	Net Area Hectares	Leading Species	Volume per ha.	Gross Volume	% Ret	Net Volume	Retention Type	NDZ	Harv/Sliv System	Harvest Season	Potential Resource Issues					
												Wildlife	Visual	Terrain	Riparian	Cultural	Mining
B1	36	36	P/SW	250	9,000	20	7,200	A	U	VR-EVEN				Y		Y	
B2	31	31	SW/P	250	7,775	50	3,888	A/D	U	VR-EVEN	W		Y	Y		Y	
B3	26	25	P	200	4,960	10	4,464	A	U	VR-EVEN			Y				
B4	46	46	P	200	9,180	10	8,262	A	U	VR-EVEN			Y	Y			
B5	26	26	P/SW	250	6,450	20	5,160	A	U	VR-EVEN		Mb/Mr	Y		Y		
B6	51	51	SW/P	250	12,625	10	11,363	A/D	U	VR-EVEN		Mr	Y		Y		
B7	16	16	P/SW	250	4,025		4,025		U	VR-EVEN					Y	Y	
B8	45	34	P	200	6,760	20	5,408	A/D	U	VR-EVEN			Y		Y	Y	
B9	49	47	P	200	9,400	20	7,520	A/D	U	VR-EVEN			Y				
B10	51	51	SB	150	7,695	20	6,156	A	U	VR-EVEN			Y		Y		
B11	24	24	SB	150	3,615	20	2,892	A	U	VR-EVEN	W		Y		Y		
B12	122	122	SB	150	18,345	10	16,511	A/D	U	VR-EVEN					Y		
B13	98	98	SB	150	14,695	10	13,217	A/D	U	VR-EVEN		Mb/Mr	Y		Y	Y	
B14	26	26	SB	150	3,960	10	3,564	A/D	U	VR-EVEN		Mb/Mr	Y			Y	

East Hyland – *Cosh* operating area

Block	Gross Area Hectares	Net Area Hectares	Leading Species	Volume per ha.	Gross Volume	% Ret	Net Volume	Retention Type	NDZ	Harv/Sliv System	Harvest Season	Potential Resource Issues					
												Wildlife	Visual	Terrain	Riparian	Cultural	Mining
C1	14	14	P	200	2,818	0	2,818		U	VR-EVEN	W	Mb			Y		
C2	59	59	P/Sw	250	14,705	20	11,764	A/D	U	VR-EVEN	W	Mb			Y		
C3	37	37	P	200	7,310	10	6,579	A/D	U	VR-EVEN	W	Mb			Y		
C4	90	90	Sw/P	250	22,500	30	15,750	A/D	U	VR-EVEN			Y			Y	
C5	136	94	Sw/P	250	23,463	20	18,770	A	U	VR-EVEN			Y	Y			
C6	152	113	F/Sw	250	28,220	20	22,576	A/D	U	VR-EVEN		Mb/Mr	Y		Y		
C7	71	44	P/Sw	250	11,042	20	8,833	A/D	U	VR-EVEN			Y		Y		
C8	17	17	Sw/P	200	3,360	0	3,360		U	VR-EVEN			Y		Y		
C9	103	83	Sw/F	250	20,840	30	14,588	A/D	U	VR-EVEN			Y				
C10	106	96	Sw/P	250	24,080	10	21,672	A/D	U	VR-EVEN			Y		Y		
C11	25	21	Sw/P	250	5,158	0	5,158		U	VR-EVEN			Y				
C12	105	73	P/Sw	250	18,155	10	16,340	A/D	U	VR-EVEN			Y	Y			
C13	81	76	Sw/P	250	18,955	30	13,269	A/D	U	VR-EVEN		Mb/Mr	Y				
C14	154	115	Sw/P	250	28,835	20	23,068	A/D	U	VR-EVEN		Mb/Mr	Y		Y		
C15	470	432	P/Sw	250	107,988	20	86,390	A/D	U	VR-EVEN		Mb	Y		Y	Y	
C16	55	45	Sw/P	250	11,263	10	10,136	A/D	U	VR-EVEN				Y	Y		

East Hyland – ***Lost*** operating area

Block	Gross Area Hectares	Net Area Hectares	Leading Species	Volume per ha.	Gross Volume	% Ret	Net Volume	Retention Type	NDZ	Harv/Silv System	Harvest Season	Potential Resource Issues					
												Wildlife	Visual	Terrain	Riparian	Cultural	Mining
L1	143	143	P	200	28,586	80	5,717	A	U	VR-EVEN		C	Y				
L2	176	176	P/Sw	250	44,048	40	26,429	A	U	VR-EVEN		C	Y				
L3	49	49	SB	200	9,786	0	9,786		U	VR-EVEN							
L4	103	103	Sw/P	250	25,740	20	20,592	A/D	U	VR-EVEN			Y				
L5	79	79	P	200	15,877	10	14,289	A	U	VR-EVEN	W	C	Y				
L6	33	33	SB	200	6,669	10	6,002	A	U	VR-EVEN	W						
L7	98	98	Sw/P	250	24,457	10	22,011	A/D	U	VR-EVEN	W	Mb/C					
L8	79	79	Sw/P	250	19,734	10	17,761	A/D	U	VR-EVEN	W						
L9	289	286	Sw/P	250	71,510	30	50,057	A/D	U	VR-EVEN		Mb/Mr			Y		
L10	68	68	P/Sw	250	16,974	40	10,184	A/D	U	VR-EVEN		Mb/Mr	Y		Y		
L11	75	75	Sw/P	250	18,807	10	16,926	A	U	VR-EVEN							
L12	137	137	P	200	27,424	20	21,939	A/D	U	VR-EVEN					Y		
L13	49	49	P/Sw	250	12,141	30	8,499	A/D	U	VR-EVEN		Mb/Mr			Y		
L14	17	17	Sw/P	250	4,234	20	3,387	A	U	VR-EVEN					Y		
L15	182	182	P/Sw	250	45,571	20	36,457	A/D	U	VR-EVEN					Y		
L16	116	116	P/Sw	250	28,976	40	17,386	A/D	U	VR-EVEN		C/Mb			Y		
L17	370	370	P/Sw	250	92,409	50	46,204	A/D	U	VR-EVEN			Y		Y		
L18	371	371	Sw/P	250	92,845	30	64,992	A/D	U	VR-EVEN			Y		Y		
L19	398	398	P/Sw	250	99,398	40	59,639	A/D	U	VR-EVEN			Y		Y		
L20	136	136	P/Sw	250	33,915	50	16,957	D/A	U	VR-EVEN		Mb	Y		Y		
L21	60	60	SB	200	11,954	70	3,586	D	U	VR-EVEN	W	Mb/Mr/C			Y		
L22	191	191	P/Sw	250	47,708	30	33,396	A/D	U	VR-EVEN					Y		
L23	81	81	P/Sw	250	20,239	10	18,215	A	U	VR-EVEN			Y		Y	Y	Y
L24	98	98	P/Sw	250	24,525	20	19,620	A/D	U	VR-EVEN					Y		
L25	190	190	P/Sw	250	47,578	40	28,547	A/D	U	VR-EVEN		Mb			Y		
L26	47	47	P/Sw	250	11,668	20	9,334	A	U	VR-EVEN		Mb			Y		
L27	23	23	P	200	4,666	10	4,200	A	U	VR-EVEN		Mb			Y		
L28	82	82	P/Sw	250	20,574	20	16,459	A/D	U	VR-EVEN		Mb/C				Y	
L29	108	108	P/Sw	250	26,918	20	21,535	A/D	U	VR-EVEN		Mb/C			Y	Y	
L30	67	67	P	200	13,462	30	9,423	A/D	U	VR-EVEN		Mb/C			Y	Y	
L31	112	112	P	200	22,381	30	15,666	A/D	U	VR-EVEN		Mb/C			Y	Y	
L32	31	31	P/Sw	250	7,643	10	6,879	A	U	VR-EVEN	W	Mb		Y		Y	
L33	102	102	P/Sw	250	25,595	10	23,035	A	U	VR-EVEN		Mb		Y		Y	
L34	38	38	P	200	7,625	0	7,625		U	VR-EVEN		Mb		Y		Y	
L35	79	71	P	200	14,298	10	12,868	A	U	VR-EVEN		Mb		Y		Y	

East Hyland – ***Hyland*** operating area

Block	Gross Area Hectares	Net Area Hectares	Leading Species	Volume per ha.	Gross Volume	% Ret	Net Volume	Retention Type	NDZ	Harv/Silv System	Harvest Season	Potential Resource Issues					
												Wildlife	Visual	Terrain	Riparian	Cultural	Mining
H1	165	165	P/Sw	200	33,066	20	26,453	A	U	VR-EVEN		Mb/Mr			Y		
H2	102	102	P/Sw	200	20,412	10	18,371	A	U	VR-EVEN					Y		
H3	486	486	P/Sw	200	97,254	20	77,803	A/D	U	VR-EVEN		Mb			Y		
H4	19	19	Sw/P	200	3,865	0	3,865	A	U	VR-EVEN		Mb			Y		
H5	36	36	Sw/P	200	7,248	10	6,524	A	U	VR-EVEN		Mb					
H6	48	48	Sw/P	200	9,598	10	8,638	A	U	VR-EVEN		Mb					
H7	85	85	P/Sw	200	17,078	10	15,370	A	U	VR-EVEN	W						
H8	16	15	P/Sw	200	3,000	10	2,700	A	U	VR-EVEN	W						
H9	44	44	P/Sw	200	8,800	20	7,040	A	U	VR-EVEN					Y		
H10	161	155	Sw	300	46,470	60	18,588	A/D	L	VR-EVEN	W	Mb/Mr			Y	Y	
H11	32	32	Sw	300	9,547	60	3,819	A/D	L	VR-EVEN	W	Mb/Mr			Y	Y	
H12	91	91	Sw/P	200	18,139	30	12,697		U	VR-EVEN					Y		
H13	30	30	Sw/P	200	5,951	30	4,166	A/D	U	VR-EVEN	W				Y		
H14	55	55	Sw/P	200	11,085	30	7,760	A/D	U	VR-EVEN	W			Y	Y		Y
H15	63	63	Sw/P	200	12,508	20	10,006	A/D	U	VR-EVEN					Y		Y
H16	88	88	Sw/P	200	17,540	10	15,786	D	U	VR-EVEN				Y	Y		Y
H17	36	36	P/Sw	200	7,161	20	5,729	A	U	VR-EVEN	W			Y			Y
H18	187	185	Sw/P	200	37,058	10	33,353	A	U	VR-EVEN	W				Y	Y	
H19	15	15	P/Sw	200	3,000	0	3,000		U	VR-EVEN	W						
H20	127	124	P/Sw	200	24,839	20	19,871	A	U	VR-EVEN	W			Y			
H21	69	69	P/Sw	200	13,800	20	11,040	A	U	VR-EVEN	W			Y			
H22	41	41	Sw	400	16,400	50	8,200	A/D	U	VR-EVEN	W						
H23	27	24	P/Sw	200	4,783	10	4,305	A	U	VR-EVEN				Y			
H24	122	119	P/Sw	200	23,886	10	21,498	A	U	VR-EVEN							
H25	179	179	P/Sw	200	35,716	10	32,144	A	U	VR-EVEN		Mb					
H26	138	138	P/Sw	200	27,538	50	13,769	A	U	VR-EVEN		Mb			Y	Y	

Appendix 2. Harvest economics

West Rancheria

Block	Area	Net Vol (m3)	Dev & Harv Cost ($/m3)	Silv Cost ($/ha)	Haul Cost (@3.74/m3)	Total Harv ($)	Total Silv ($)	Road Cost ($)	Break-Even Cost ($ / m3)
R1	21	1,538	22	2,139	5,750	33,825	43,850		
R2	289	26,010	22	2,139	97,277	572,220	618,171		
R3	32	1,166	22	1,445	4,362	25,661	46,818		
R4	408	24,486	22	2,139	91,578	538,692	872,926		
R5	27	4,095	22	1,445	15,315	90,090	39,449		
R6	56	7,506	20	1,445	28,072	150,120	80,342		
R7	127	17,105	22	1,445	63,971	376,299	183,082		
R8	44	4,730	22	2,139	17,692	104,069	93,688		
R9	369	38,756	22	2,139	144,946	852,621	789,505		
R10	68	9,140	22	2,139	34,182	201,069	144,810		
R11	25	3,810	22	2,540	14,249	83,820	64,516		
R12	70	7,538	20	2,139	28,194	150,768	149,302		
R13	16	1,884	22	2,139	7,046	41,448	33,582		
R14	198	16,598	30	2,139	62,078	497,952	422,666		
R15	91	8,698	30	2,139	32,529	260,928	193,793		
R16	36	4,874	20	1,445	18,227	97,470	52,165		
R17	77	8,075	22	2,540	30,199	177,639	195,326		
R18	258	22,575	22	2,540	84,431	496,650	655,320		
R19	154	15,400	30	2,139	57,596	462,000	329,406		
R20	76	5,479	22	2,139	20,492	120,542	162,778		
R21	146	14,610	22	2,540	54,641	321,420	371,094		
R22	58	6,900	22	2,139	25,806	151,800	122,993		
R23	66	7,425	30	2,139	27,770	222,750	141,174		
R24	97	10,498	22	2,139	39,261	230,947	207,911		
R25	24	2,938	22	2,139	10,986	64,625	50,267		
R26	43	4,883	22	2,139	18,261	107,415	92,833		
R27	148	14,227	30	2,540	53,210	426,816	376,428		
TOTAL	3,022	290,941			1,088,120	6,859,656	6,534,193	591,495	$51.81

Watson Lake

Block	Area	Net Vol (m3)	Dev & Harv Cost ($/m3)	Silv Cost ($/ha)	Haul Cost (@1.50/m3)	Total Harv ($)	Total Silv ($)	Road Cost ($)	Break-Even Cost ($ / m3)
W1	120	16,013	22	2,139	24,020	352,290	257,536		
W2	45	6,021	22	1,445	9,032	132,462	64,447		
W3	91	10,896	22	1,445	16,344	239,712	131,206		
W4	60	7,140	22	2,139	10,710	157,080	127,271		
W5	89	12,056	22	2,139	18,083	265,221	191,013		
W6	99	13,325	22	2,139	19,987	293,139	211,119		
W7	114	13,704	22	2,139	20,556	301,488	244,274		
W8	483	67,592	22	2,139	101,388	1,487,024	1,032,709		
W9	61	7,272	22	1,445	10,908	159,984	87,567		
W10	83	12,495	24	2,540	18,743	299,880	211,582		
W11	20	2,040	22	1,445	3,060	44,880	29,478		
W12	104	16,816	22	2,139	25,223	369,943	222,028		
W13	46	7,468	22	2,139	11,202	164,300	98,608		
Totals	1,415	192,837			289,256	4,267,404	2,908,837	217,500	$39.84

East Hyland – *Boundary*

Block	Area	Net Vol (m3)	Dev & Harv Cost ($/m3)	Silv Cost ($/ha)	Haul Cost (@2.67/m3)	Total Harv ($)	Total Silv ($)	Road Cost	Break-Even Cost ($ / m3)
B1	36	7,760	22	2,139	20,719	170,720	77,004		
B2	31	3,888	24	2,540	10,380	93,300	78,994		
B3	25	4,464	22	2,139	11,919	98,208	53,047		
B4	46	8,262	22	2,139	22,060	181,764	98,180		
B5	26	5,160	22	2,139	13,777	113,520	55,186		
B6	51	11,363	22	2,139	30,338	249,975	108,020		
B7	16	4,025	22	2,139	10,747	88,550	34,438		
B8	34	5,408	22	2,139	14,439	118,976	72,298		
B9	47	7,520	22	2,139	20,078	165,440	100,533		
B10	51	6,156	22	2,139	16,437	135,432	109,731		
B11	24	2,892	22	2,139	7,722	63,624	51,550		
B12	122	16,511	22	2,139	44,083	363,231	261,600		
B13	98	13,217	22	2,139	35,288	290,763	209,408		
B14	26	3,564	22	2,139	9,516	78,408	56,470		
TOTAL	633	100,188			267,502	2,211,911	1,366,458	457,870	$42.96

East Hyland – *Cosh*

Block	Area	Net Vol (m3)	Dev & Harv Cost ($/m3)	Silv Cost ($/ha)	Haul Cost (@2.67/m3)	Total Harv ($)	Total Silv ($)	Road Cost ($)	Break-Even Cost ($ / m3)
C1	14	2,818	22	2,540	7,524	61,996	35,789		
C2	59	11,764	22	2,139	31,410	258,808	125,816		
C3	37	6,579	22	2,139	17,566	144,738	78,180		
C4	90	15,892	22	2,139	42,431	349,619	192,510		
C5	94	18,770	22	2,139	50,116	412,940	200,745		
C6	113	22,576	30	2,139	60,278	677,280	241,450		
C7	44	8,833	22	2,139	23,585	194,335	94,473		
C8	17	3,360	22	2,139	8,971	73,920	35,935		
C9	83	14,588	22	1,445	38,950	320,936	120,455		
C10	96	21,672	22	2,139	57,864	476,784	206,028		
C11	21	5,158	22	2,139	13,771	113,465	44,128		
C12	73	16,340	30	2,139	43,626	490,185	155,334		
C13	76	13,269	22	1,445	35,427	291,907	109,560		
C14	115	23,068	22	1,445	61,592	507,496	166,666		
C15	432	86,390	22	2,139	230,661	1,900,580	923,941		
C16	45	10,136	22	2,139	27,064	222,998	96,362		
TOTAL	1,408	281,212			750,836	6,497,986	2,827,374	207,517	$36.57

East Hyland - *Irons*

Block	Area	Net Vol (m3)	Dev & Harv Cost ($/m3)	Silv Cost ($/ha)	Haul Cost (@2.67/m3)	Total Harv ($)	Total Silv ($)	Road Cost ($)	Break-Even Cost ($ / m3)
I1	92	18,363	22	2,139	49,029	403,988	196,393		
I2	53	9,359	22	2,139	24,989	205,898	114,394		
I3	32	7,179	22	2,139	19,168	157,935	68,247		
I4	46	9,120	22	2,139	24,349	200,631	97,534		
I5	90	15,746	22	2,139	42,042	346,410	192,460		
TOTAL	313	59,766			159,576	1,314,861	669,028	103,407	$37.59

East Hyland - *Hyland*

Block	Area	Net Vol (m3)	Dev & Harv Cost ($/m3)	Silv Cost ($/ha)	Haul Cost (@4.15/m3)	Total Harv ($)	Total Silv ($)	Road Cost ($)	Break-Even Cos ($ / m3)
H1	165	26,453	22	2,139	109,780	581,966	353,643		
H2	102	18,371	22	2,139	76,238	404,152	218,303		
H3	486	77,803	22	2,139	322,884	1,711,672	1,040,133		
H4	19	3,865	22	2,139	16,041	85,035	41,339		
H5	36	6,524	22	2,139	27,073	143,518	77,521		
H6	48	8,638	22	2,139	35,849	190,041	102,651		
H7	85	15,370	22	2,139	63,787	338,148	182,651		
H8	15	2,700	22	2,139	11,205	59,400	32,085		
H9	44	7,040	22	2,139	29,216	154,880	94,116		
H10	155	18,588	24	2,540	77,140	446,110	393,444		
H11	32	3,819	24	2,540	15,848	91,650	80,831		
H12	91	12,697	22	2,139	52,694	279,343	193,998		
H13	30	4,166	22	2,139	17,289	91,652	63,651		
H14	55	7,760	22	2,139	32,203	170,712	118,556		
H15	63	10,006	22	2,139	41,526	220,137	133,771		
H16	88	15,786	30	2,139	65,513	473,590	187,594		
H17	36	5,729	30	2,139	23,776	171,872	76,590		
H18	185	33,353	22	2,139	138,413	733,758	396,340		
H19	15	3,000	30	2,139	12,450	90,000	32,085		
H20	124	19,871	30	2,139	82,466	596,143	265,656		
H21	69	11,040	22	2,139	45,816	242,880	147,591		
H22	41	8,200	30	2,139	34,030	246,000	87,699		
H23	24	4,305	22	2,139	17,865	94,704	51,155		
H24	119	21,498	22	1,445	89,215	472,949	172,579		
H25	179	32,144	22	1,445	133,399	707,175	258,047		
H26	138	13,769	22	1,445	57,141	302,918	198,962		
Total	2,444	392,495			1,628,856	9,100,405	5,000,992	960,211	$42.52

East Hyland - *Lost*

Block	Area	Net Vol (m3)	Dev & Harv Cost ($/m3)	Silv Cost ($/ha)	Haul Cost (@3.70/m3)	Total Harv ($)	Total Silv ($)	Road Cost ($)	Break-Even Cost ($ / m3)
L1	143	5,717	24	2,139	21,154	137,215	305,731		
L2	176	26,429	22	2,139	97,786	581,433	376,874		
L3	49	9,786	20	2,540	36,207	195,713	124,278		
L4	103	20,592	30	2,139	76,191	617,767	220,234		
L5	79	14,289	20	1,445	52,870	285,785	114,711		
L6	33	6,002	20	2,540	22,209	120,047	84,700		
L7	98	22,011	22	2,139	81,441	484,246	209,253		
L8	79	17,761	22	2,139	65,714	390,732	168,843		
L9	286	50,057	22	2,139	185,210	1,101,248	611,836		
L10	68	10,184	22	2,139	37,682	224,053	145,227		
L11	75	16,926	22	2,139	62,626	372,372	160,910		
L12	137	21,939	20	1,445	81,176	438,788	198,140		
L13	49	8,499	22	1,445	31,445	186,968	70,174		
L14	17	3,387	22	1,445	12,533	74,520	24,473		
L15	182	36,457	22	2,139	134,890	802,047	389,904		
L16	116	17,386	22	1,445	64,327	382,485	167,482		
L17	370	46,204	22	1,445	170,956	1,016,497	534,123		
L18	371	64,992	22	2,139	240,469	1,429,816	794,383		
L19	398	59,639	22	1,445	220,663	1,312,052	574,520		
L20	136	16,957	22	1,445	62,743	373,064	196,028		
L21	60	3,586	24	2,139	13,269	86,067	127,845		
L22	191	33,396	22	2,139	123,565	734,710	408,193		
L23	81	18,215	22	1,445	67,395	400,726	116,980		
L24	98	19,620	22	1,445	72,594	431,640	141,754		
L25	190	28,547	22	2,139	105,624	628,032	407,079		
L26	47	9,334	22	2,139	34,536	205,351	99,828		
L27	23	4,200	20	1,445	15,539	83,995	33,715		
L28	82	16,459	22	1,445	60,898	362,099	118,917		
L29	108	21,535	22	1,445	79,679	473,764	155,588		
L30	67	9,423	20	1,445	34,866	188,465	97,262		
L31	112	15,666	20	2,139	57,966	313,327	239,360		
L32	31	6,879	22	2,139	25,452	151,338	65,396		
L33	102	23,035	22	2,139	85,230	506,774	218,988		
L34	38	7,625	20	1,445	28,213	152,502	55,091		
L35	71	12,868	20	1,445	47,611	257,358	103,301		
TOTAL	4,266	705,602			2,610,728	15,502,995	7,861,122	888,627	$38.07

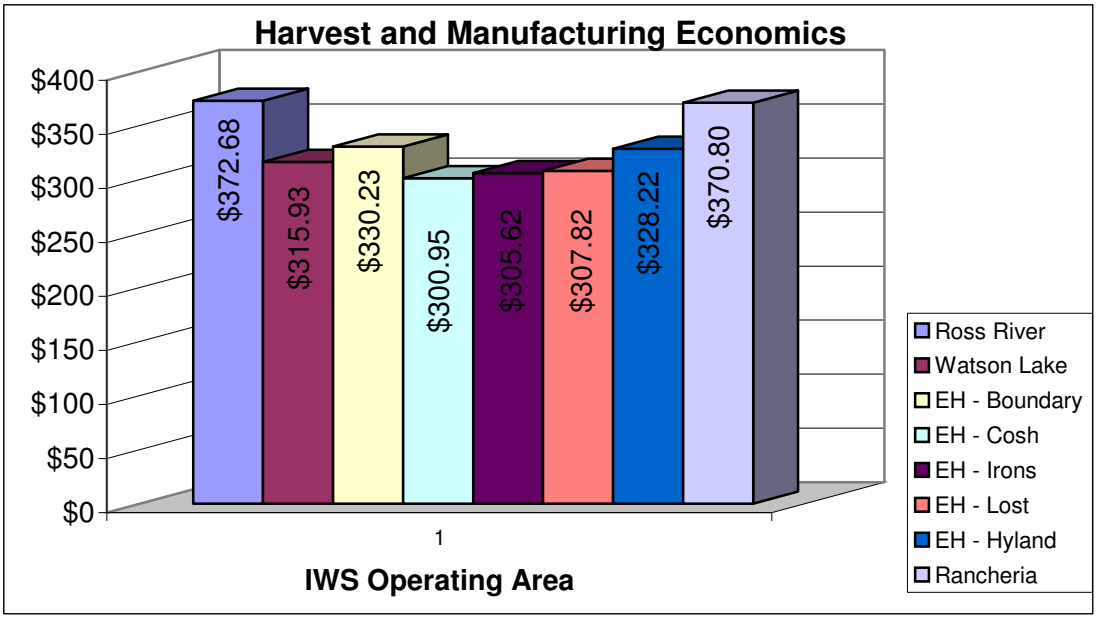
Ross River

Block	Area	Net Vol (m3)	Dev & Harv Cost ($/m3)	Silv Cost ($/ha)	Haul Cost (@2.50/m3)	Total Harv ($)	Total Silv ($)	Road Cost ($)	Break-Even Cost ($ / m3)
BUT 1	176	15,867	22	2,139	39,668	349,074	377,106		
BUT 2	48	5,772	24	2,139	14,430	138,528	102,886		
BUT 3	40	4,836	24	2,139	12,090	116,064	86,202		
BUT 4	60	5,382	24	2,139	13,455	129,168	127,912		
BUT 5	19	2,997	24	2,139	7,493	71,928	39,572		
BUT 6	34	3,024	24	2,139	7,560	72,576	71,870		
BUT 7	35	2,094	24	2,139	5,235	50,256	74,651		
BUT 8	45	2,676	24	2,139	6,690	64,224	95,399		
BUT 9	39	2,334	24	2,139	5,835	56,016	83,207		
BUT 10	152	10,937	24	2,139	27,342	262,483	324,914		
BUT 11	112	15,441	24	2,540	38,603	370,590	285,242		
BUT 12	41	4,039	24	2,139	10,098	96,941	87,271		
BUT 13	58	7,790	22	2,139	19,474	171,369	123,420		
BUT 14	25	3,024	22	2,540	7,560	66,528	64,008		
BUT 15	142	17,917	22	2,139	44,793	394,178	304,166		
								339,600	
COF 1	51	3,328	24	2,139	8,320	79,872	109,517		
COF 2	86	5,590	24	2,139	13,975	134,160	183,954		
COF 3	32	2,835	24	2,139	7,088	68,040	67,379		
COF 4	40	2,594	24	2,139	6,484	62,244	85,346		
COF 5	44	2,860	24	2,139	7,150	68,640	94,116		
COF 6	37	2,399	24	2,139	5,996	57,564	78,929		
								64,400	
Totals	1,315	123,735			309,337	2,880,443	2,867,067	404,000	$52.22

Summary – All planning units

Planning Unit	Break-Even Cost ($/m3)	Stumpage (10% of BE) ($/m3)	Milling Cost ($/m3)	Total Cost ($/m3)	LRF Adjustment (fbm/m3)	Cost per 1000 fbm ($cdn)
Ross River	52.22	5.22	32.00	89.44	240	$372.68
Watson Lake	39.84	3.98	32.00	75.82	240	$315.93
EH - Boundary	42.96	4.30	32.00	79.26	240	$330.23
EH - Cosh	36.57	3.66	32.00	72.23	240	$300.95
EH - Irons	37.59	3.76	32.00	73.35	240	$305.62
EH - Lost	38.07	3.81	32.00	73.88	240	$307.82
EH - Hyland	42.52	4.25	32.00	78.77	240	$328.22
Rancheria	51.81	5.18	32.00	88.99	240	$370.80

** random length 2X4 (SPF) lumber price, July 28th 2003 = $cdn 356.76



Appendix 3. Listed species in theYukon

The information in this Appendix is taken from the report *Wild Species 2000: The general status of species in Canada* (Anon). Available at http://www.wildspecies.ca/wildspecies2000/en/

The report is the responsibility of a national working group composed of representatives from all provinces and territories and two federal government agencies — Environment Canada (Canadian Wildlife Service) and Fisheries and Oceans Canada. The national working group established which groups of species would be ranked in this first report and the general guidelines for the criteria that would be used to derive general status ranks. Provincial and territorial representatives held the primary responsibility for establishing lists of species that occur in their province or territory. These representatives were also responsible for the sourcing, compilation, and interpretation of the information that would both inform their province's or territory's ranks for given species and serve as a resource tailored to the particular needs of that province or territory. Once provincial and territorial general status ranks were established, the national working group was the body responsible for assigning a Canada-wide rank: a national general status rank that interprets the overall state of the species in Canada based on the information about populations in each province or territory.

The working group member for Yukon is

Manfred Hoefs
Chief, Habitat and Endangered Species
Fish and Wildlife Branch
Department of Renewable Resources
Government of the Yukon Territory

The *Yukon Wildlife Act* lists eight "specially protected" species in the Territory; namely: elk, wood bison, muskox, mule deer, cougar, gyrfalcon, peregrine falcon, and trumpeter swan. Also stated as being of "special concern" are: grizzly bear, wolverine, short-eared owl, and Squanga whitefish. Mule deer, cougar, muskox, and elk are considered at risk in Yukon but not elsewhere.

Appendix 3. Species listed as threatened or sensitive in the Yukon *

* Source: *Species 2000: The General Status of Species in Canada.*

1	At Risk
2	May be at risk
3	Sensitive
4	Secure
5	Undetermined
6	Not Assessed

Status in Canada	Common Name	Latin Name	Status in YT
	PLANTS		
4	Slender Bog-Orchid	*Platanthera stricta*	1
4	Ostrich Fern	*Matteuccia struthiopteris*	1
2	Bog Adder's-Mouth	*Malaxis paludosa*	1
4	Leathery Grape-Fern	*Botrychium multifidum*	1
3	Upward-Lobed Moonwort	*Botrychium ascendens*	2
3	Nahanni Oak Fern	*Gymnocarpium jessoense*	2
3	Northern Woodsia	*Woodsia alpina*	3
4	Calypso	*Calypso bulbosa*	3
	FISHES		
6	White Sucker	*Catostomus commersoni*	3
6	Squanga Whitefish	*Coregonus sp*	3
6	Chum Salmon	*Oncorhynchus keta*	3
6	Sockeye Salmon	*Oncorhynchus nerka*	3
6	Chinook Salmon	*Oncorhynchus tshawytscha*	3
6	Bull Trout	*Salvelinus confluentus*	3
6	Lake Trout	*Salvelinus namaycush*	3
	AMPHIBIANS		
4	Western Toad	*Bufo boreas*	3
	BIRDS		
4	Le Conte's Sparrow	*Ammodramus leconteii*	1
4	Ruddy Turnstone	*Arenaria interpres*	1
4	Brant	*Branta bernicla*	1
4	Black Guillemot	*Cepphus grylle*	1
3	Black Tern	*Chlidonias niger*	1
4	Marsh Wren	*Cistothorus palustris*	1
4	Bay-Breasted Warbler	*Dendroica castanea*	1
4	Magnolia Warbler	*Dendroica magnolia*	1
4	Cape May Warbler	*Dendroica tigrina*	1
4	Pileated Woodpecker	*Dryocopus pileatus*	1
4	Yellow-Billed Loon	*Gavia adamsii*	1
4	Short-Billed Dowitcher	*Limnodromus griseus*	1
2	Bluethroat	*Luscinia svecica*	1
4	Song Sparrow	*Melospiza melodia*	1
4	Black-And-White Warbler	*Mniotilta varia*	1
2	Yellow Wagtail	*Motacilla flava*	1
4	Mourning Warbler	*Oporornis philadelphia*	1
4	Macgillivray's Warbler	*Oporornis tolmiei*	1
4	Dble-Crested Cormorant	*Phalacrocorax auritus*	1
3	Red Phalarope	*Phalaropus fulicaria*	1
4	Wilson's Phalarope	*Phalaropus tricolor*	1
4	Rose-Breasted Grosbeak	*Pheucticus ludovicianus*	1
4	Western Tanager	*Piranga ludoviciana*	1
4	Mountain Chickadee	*Poecile gambeli*	1
4	Eastern Phoebe	*Sayornis phoebe*	1
4	Ovenbird	*Seiurus aurocapillus*	1
4	Common Eider	*Somateria mollissima*	1
3	King Eider	*Somateria spectabilis*	1
4	Winter Wren	*Troglodytes troglodytes*	1
4	Red-Eyed Vireo	*Vireo olivaceus*	1
4	Philadelphia Vireo	*Vireo philadelphicus*	1
4	Blue-Headed Vireo	*Vireo solitarius*	1
4	Canada Warbler	*Wilsonia canadensis*	1
3	Surfbird	*Aphriza virgata*	2
3	Swainson's Hawk	*Buteo swainsoni*	2
3	Peregrine Falcon	*Falco peregrinus*	2
3	Brewer's Sparrow	*Spizella breweri*	2
3	Buff-Breasted Sandpiper	*Tryngites subruficollis*	2

Status in Canada	Common Name	Latin Name	Status in YT
	BIRDS (cont.)		
4	Northern Goshawk	*Accipiter gentilis*	3
4	Sharp-Shinned Hawk	*Accipiter striatus*	3
4	Boreal Owl	*Aegolius funereus*	3
4	Gadwall	*Anas strepera*	3
4	Golden Eagle	*Aquila chrysaetos*	3
3	Short-Eared Owl	*Asio flammeus*	3
4	Greater Scaup	*Aythya marila*	3
4	Red-Tailed Hawk	*Buteo jamaicensis*	3
4	Rough-Legged Hawk	*Buteo lagopus*	3
4	Smith's Longspur	*Calcarius pictus*	3
4	Pectoral Sandpiper	*Calidris melanotos*	3
4	Semipalmated Sandpiper	*Calidris pusilla*	3
4	Killdeer	*Charadrius vociferus*	3
4	Northern Harrier	*Circus cyaneus*	3
4	Long-Tailed Duck	*Clangula hyemalis*	3
4	Blue Grouse	*Dendragapus obscurus*	3
4	Hammond's Flycatcher	*Empidonax hammondii*	3
4	Least Flycatcher	*Empidonax minimus*	3
4	Dusky Flycatcher	*Empidonax oberholseri*	3
4	Gyrfalcon	*Falco rusticolus*	3
4	American Kestrel	*Falco sparverius*	3
4	American Coot	*Fulica americana*	3
4	Sandhill Crane	*Grus canadensis*	3
4	Bald Eagle	*Haliaeetus leucocephalus*	3
4	White-Tailed Ptarmigan	*Lagopus leucurus*	3
4	Thayer's Gull	*Larus thayeri*	3
3	Long-Billed Dowitcher	*Limnodromus scolopaceus*	3
3	White-Winged Scoter	*Melanitta fusca*	3
3	Surf Scoter	*Melanitta perspicillata*	3
4	Swamp Sparrow	*Melospiza georgiana*	3
4	American Whimbrel	*Numenius phaeopus*	3
4	Snowy Owl	*Nyctea scandiaca*	3
5	Northern Wheatear	*Oenanthe oenanthe*	3
4	Ruddy Duck	*Oxyura jamaicensis*	3
4	Osprey	*Pandion haliaetus*	3
3	Red-Necked Phalarope	*Phalaropus lobatus*	3
4	Blk-Backed Woodpecker	*Picoides arcticus*	3
4	Sora	*Porzana carolina*	3
4	American Redstart	*Setophaga ruticilla*	3
4	Mountain Bluebird	*Sialia currucoides*	3
4	Red-Breasted Nuthatch	*Sitta canadensis*	3
4	Arctic Tern	*Sterna paradisaea*	3
4	Great Gray Owl	*Strix nebulosa*	3
4	Northern Hawk Owl	*Surnia ulula*	3
4	Sharp-Tailed Grouse	*Tympanuchus phasianellus*	3
4	Warbling Vireo	*Vireo gilvus*	3
4	White-Throated Sparrow	*Zonotrichia albicollis*	3
	MAMMALS		
4	Muskox	*Ovibos moschatus*	1
4	White-Tailed Deer	*Odocoileus virginianus*	1
4	Wapiti	*Cervus elaphus*	1
3	American Bison	*Bos bison*	2
3	Polar Bear	*Ursus maritimus*	2
4	Arctic Fox	*Alopex lagopus*	3
4	Gray Wolf	*Canis lupus*	3
3	Ogilvie Mtn Coll'd Lemming	*Dicrostonyx nunatakensis*	3
3	Wolverine	*Gulo gulo*	3
4	Mountain Goat	*Oreamnos americanus*	3
3	Grizzly Bear	*Ursus arctos*	3
4	Western Jumping Mouse	*Zapus princeps*	3